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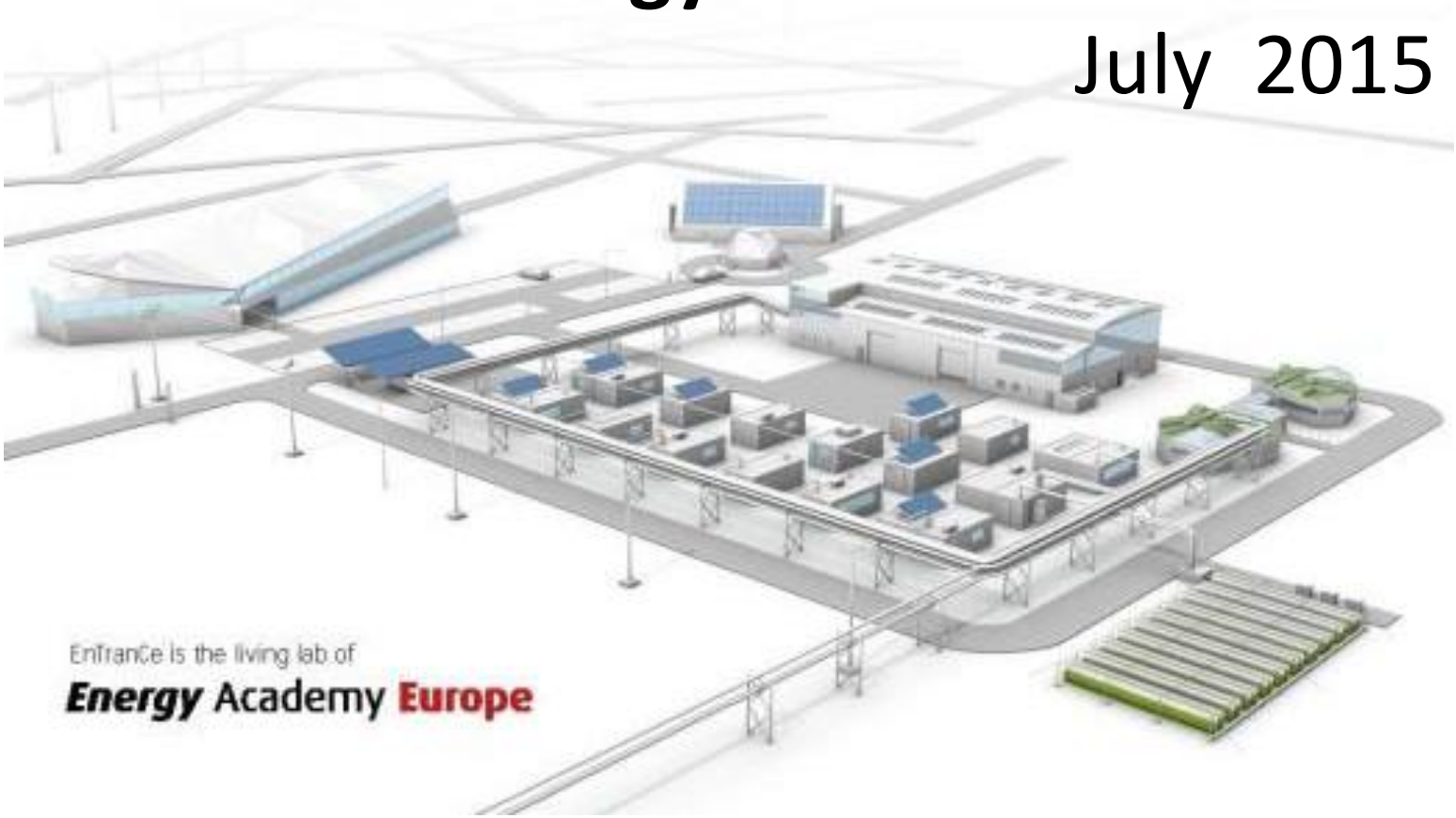
Renewable Energy in The Netherlands
July 2015



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This analyses contains information of various sources and own analyses, including various estimates.

Readers are encouraged to add, to improve the quality of the information provided.

July 2015

In a Nutshell

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- The fraction of renewable energy was 6.8%; this was the highest fraction ever recorded in The Netherlands
- Electricity production by Wind doubled compared to July 2014 due to high wind availability
- Average utilization of wind capacity was 25% and for solar-PV 17%
- Coal usage in Dutch power generation increased by 37% y-o-y.
- Simultaneously, gas used to generate power decreased by 50% y-o-y.
- Dutch CO2 emissions were on par with July 2014.
- The fraction renewable power increased from 9.2% (July 2014) to 12.0%.
- The fraction of renewable energy was 6.8%, compared to 6.5% in July 2014

Content

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- July 2015 data
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- Monthly data
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- Miscellaneous

SELECTED ENERGY DATA FROM JULY 2015

Final Energy Demand

July 2015

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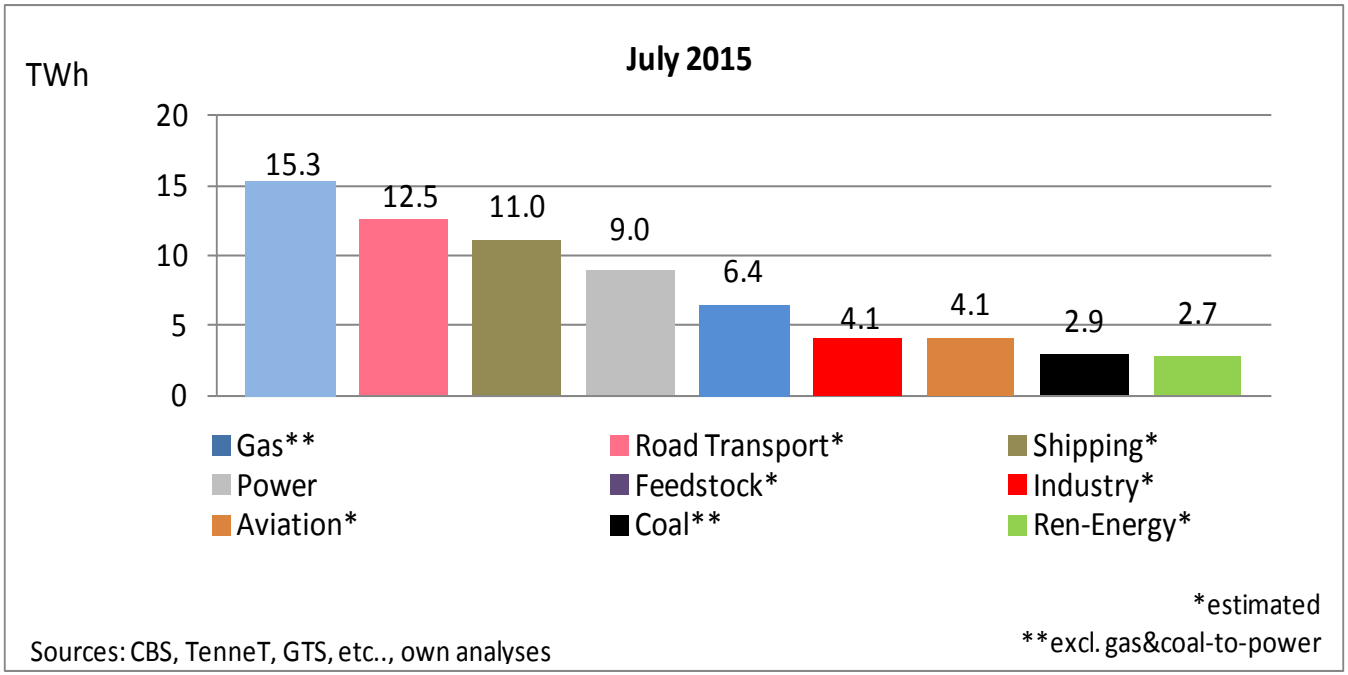

Energy is used for many different purposes. In July 2015, the most important applications were heating/gas (15 TWh) and Transport (27 TWh). Renewables are given by comparison.

Final Energy Demand July 2015 (vs 2014)

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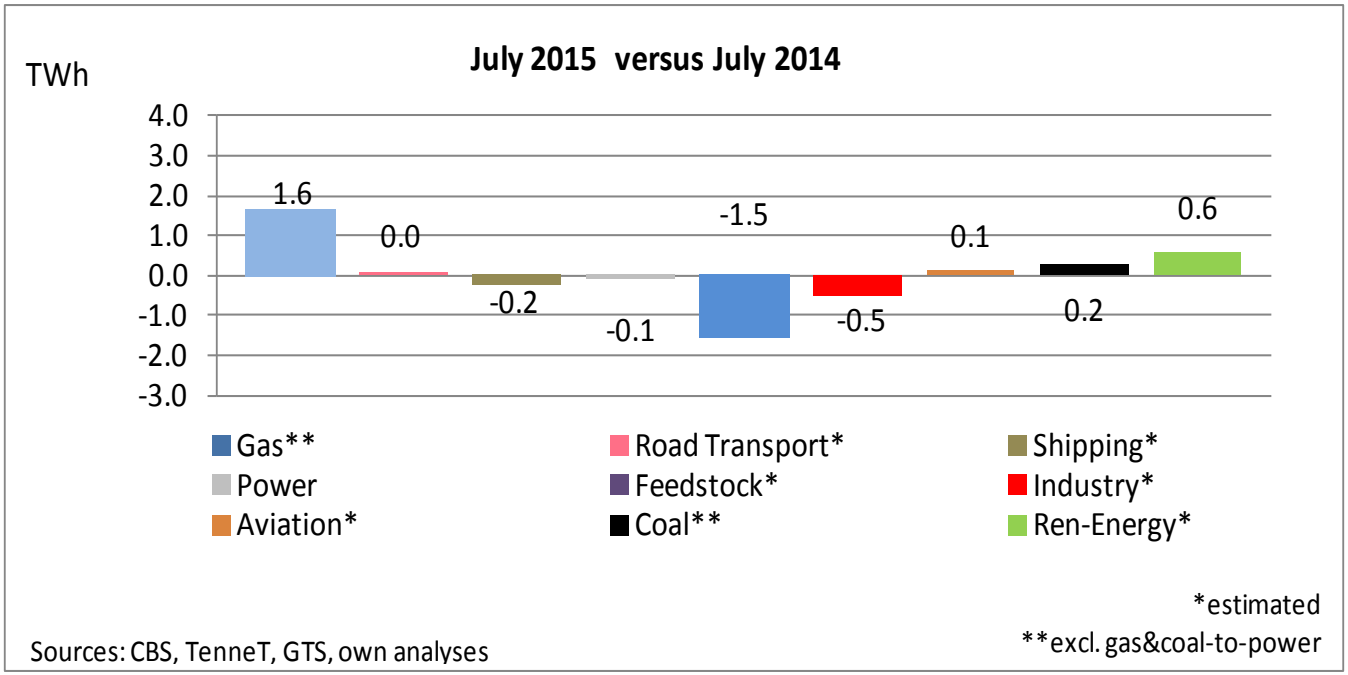

In July 2015, gas consumption was higher than last year, mainly due to lower temperatures. Based on CBS data, energy used for feedstock is estimated to be significantly lower than in 2014. Due to higher wind and solar-PV, renewable energy was higher than last year.

CO2 Emissions

July 2015

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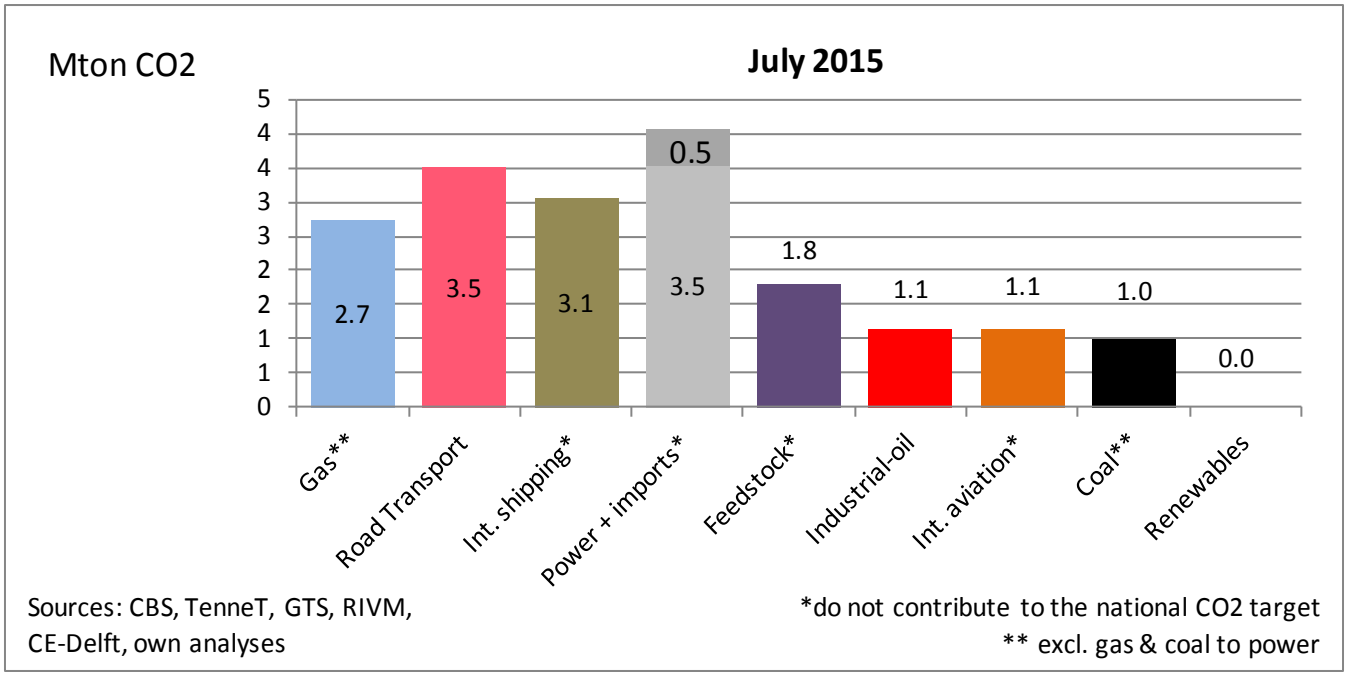

The national CO2 emissions for June 2015, excluding power imports, feedstock and international shipping & aviation, have been estimated at 11.9 Mton. This was slightly higher than in June 2014. The main CO2 contributions came from the power sector and road transport.

Power Generation Capacity July 2015

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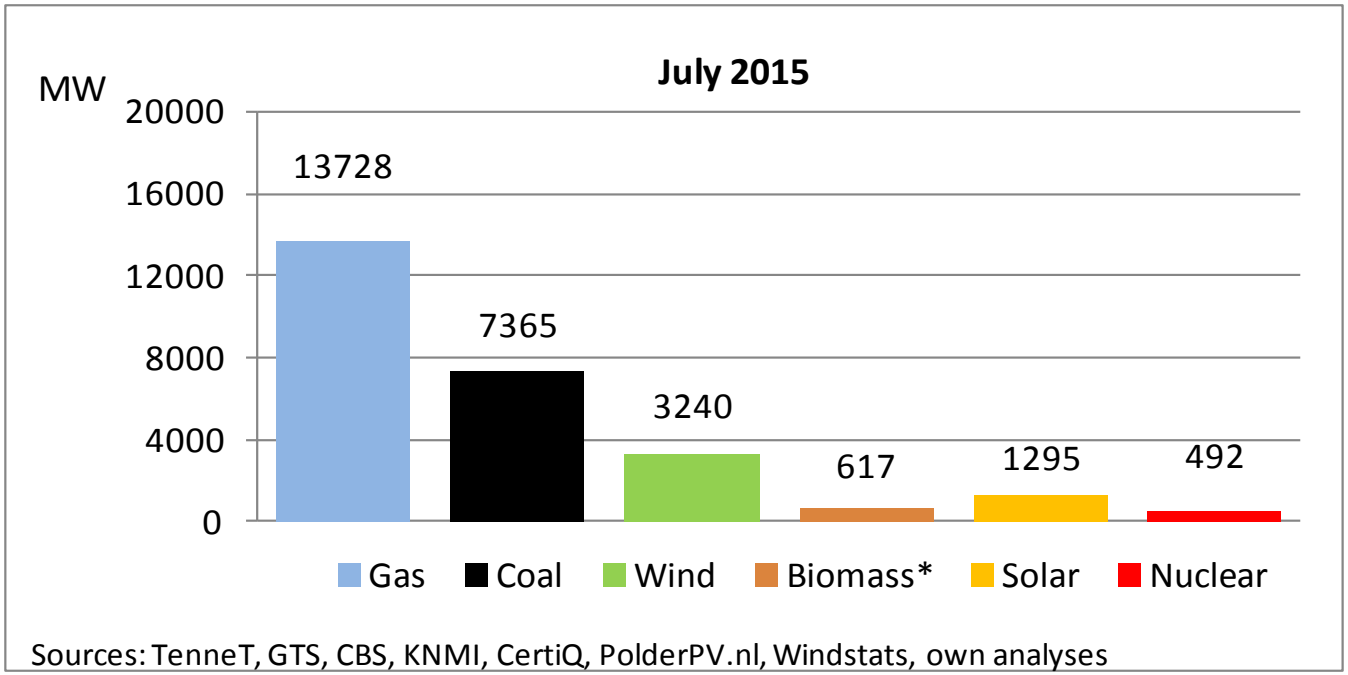

This summer, the second 800 MW unit of the RWE coal-fired power station at Eemshaven came online. The growth of wind and solar-PV has continued.

Power Supplies

July 2015

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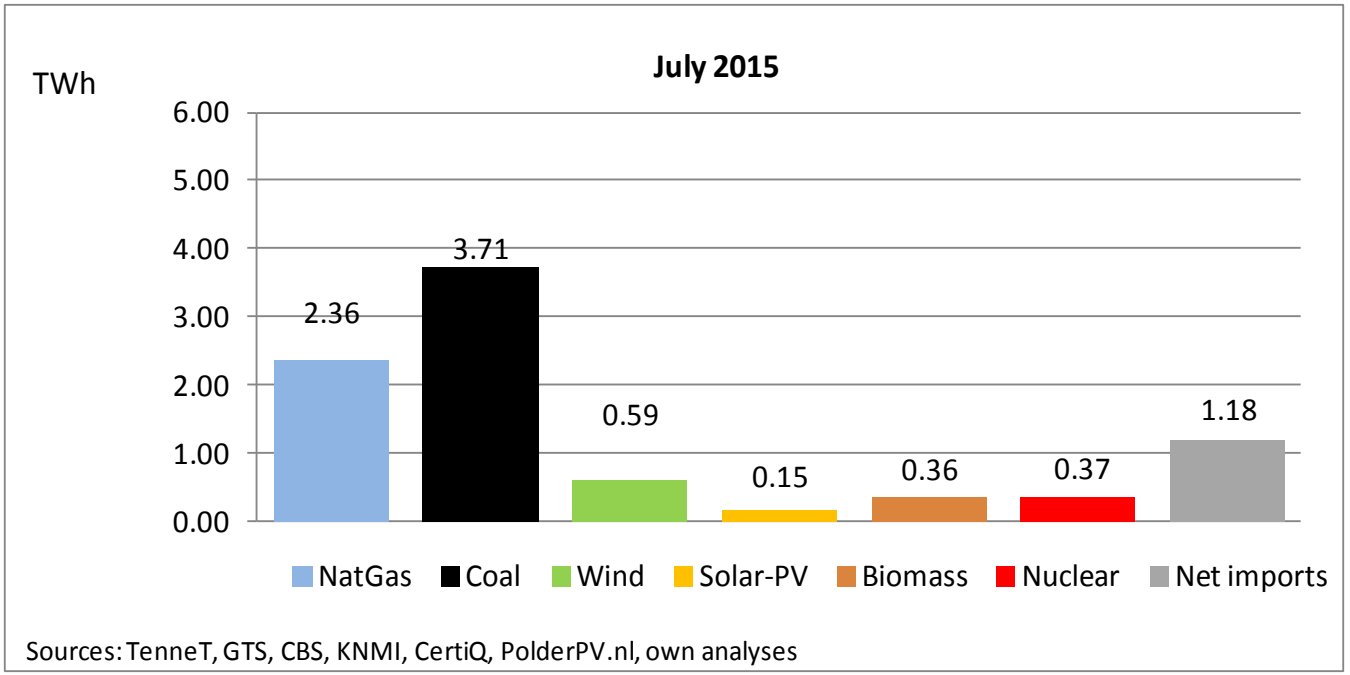
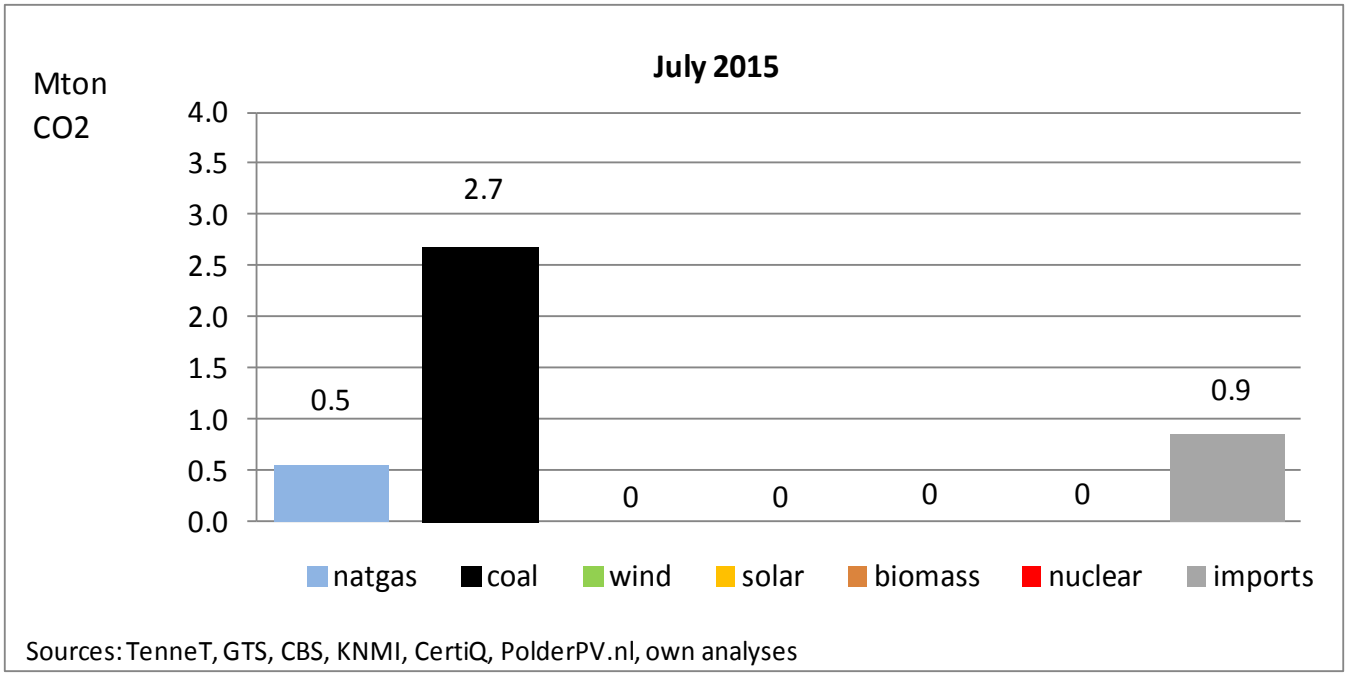


In July 2015, power consumption was 9 TWh, the same as last year. Most power has been generated by coal-fired power stations. The usage of coal for power generation increased by 37% y-o-y. In July 2015, the average contribution from renewables to the power system was 12.0%, compared to 9.2% in July 2014, due to much more wind this month.

CO2 from Power Generation

July 2015



The CO2 emissions from imports are given for comparison, as these emissions do not contribute to the National Dutch CO2 emission level. In July 2015, 85% of the CO2 emissions from the power sector came from the coal-fired power stations.

SELECTED MONTHLY PROFILES

(using daily data)

Gas and Power Demand July 2015

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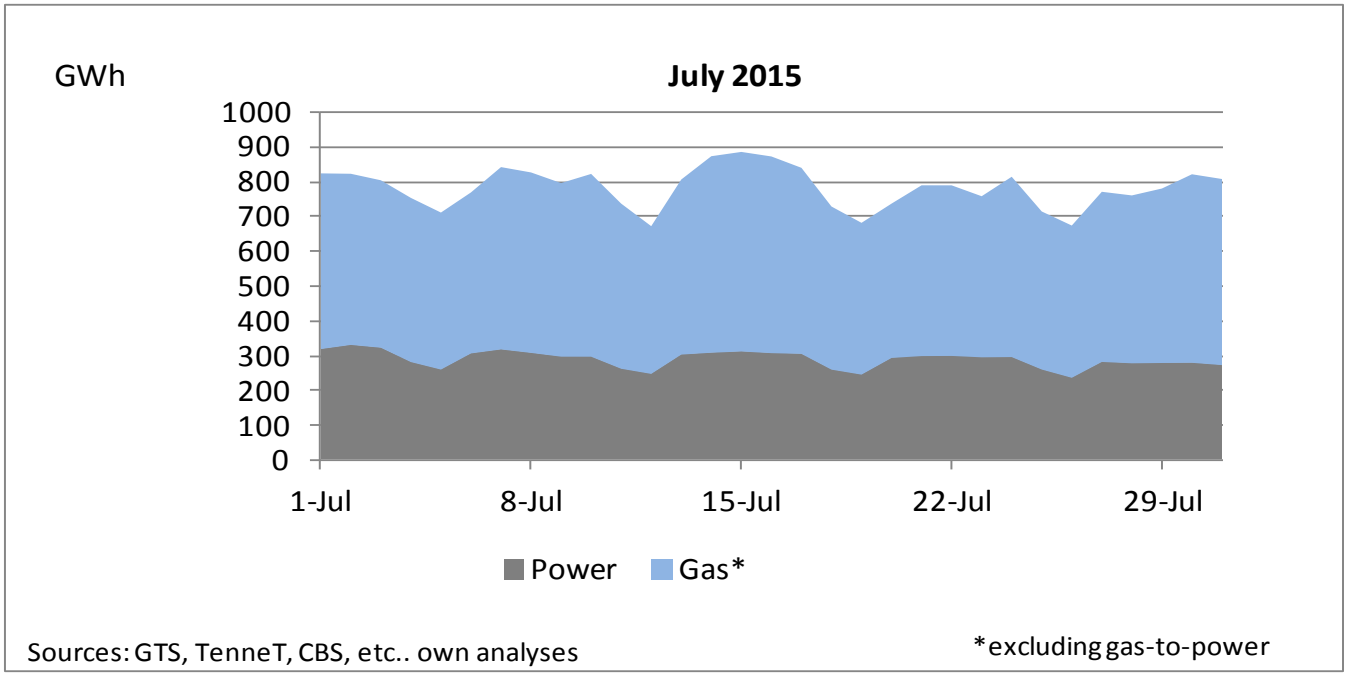
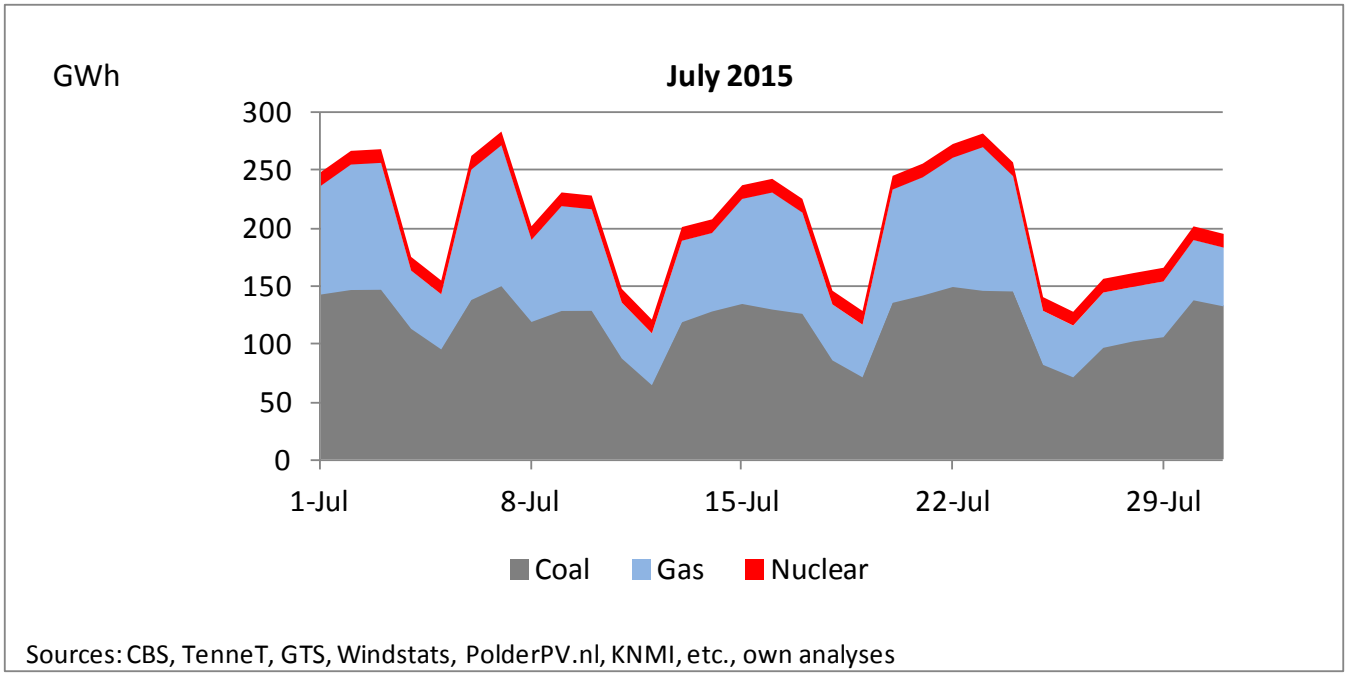


Daily power demand shows a week-weekend pattern. Daily gas demand (excluding gas demand for power) from industry has a similar pattern. In summer, not much gas is used for the heating market, which is mainly affected by ambient temperature.

Conventional Power Production July 2015



Sources: CBS, TenneT, GTS, Windstats, PolderPV.nl, KNMI, etc., own analyses

Coal-fired power stations showed a week-weekend pattern. Gas-fired generation used, is typically must-run capacity (e.g. cogeneration) or necessary to balance the system. On July 6 and 7th, and In the week 20-24 July, The Netherlands was a net exporter of power and significant gas-fired power was used to balance the system.

Wind and Solar Power Production July 2015

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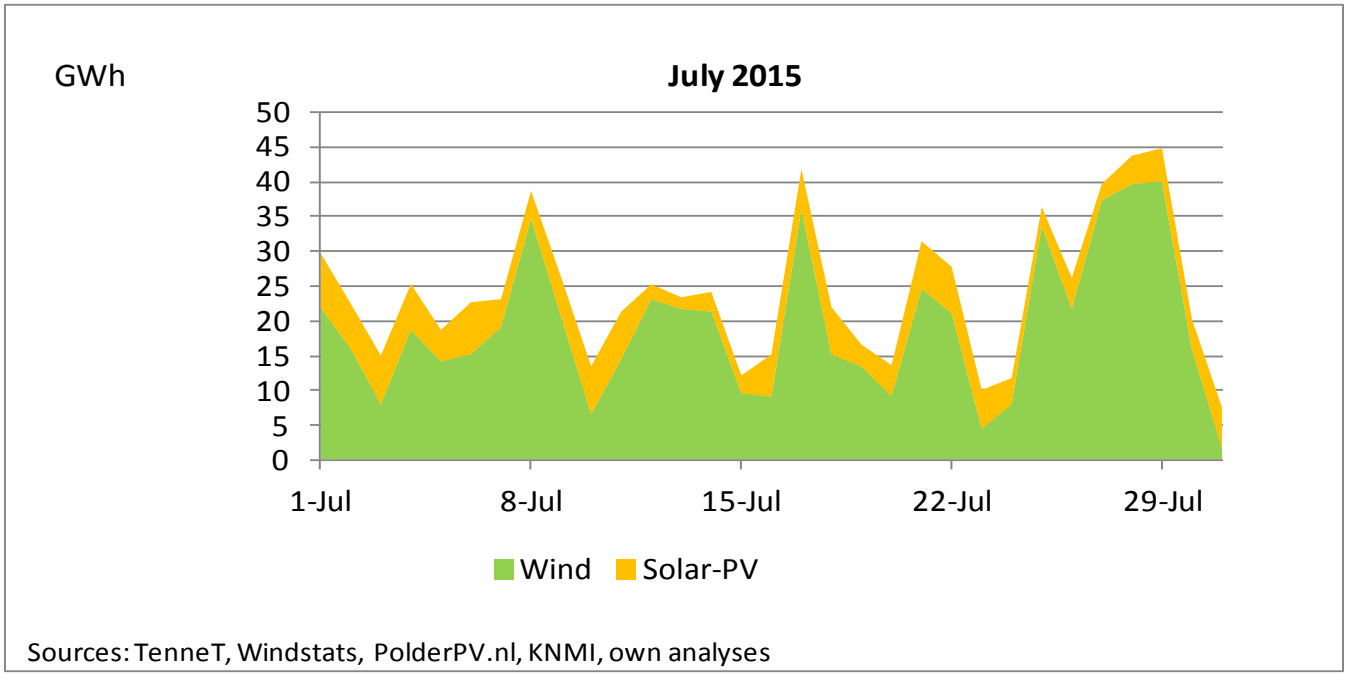

Sources: TenneT, Windstats, PolderPV.nl, KNMI, own analyses

July was not so sunny, but rather windy. Hence, combined with a significant increase in installed capacity, wind energy production increased by 94% compared to July 2014.

1 GWh is sufficient to provide power for a year to 300 households.

Contribution of Renewable Energy July2015

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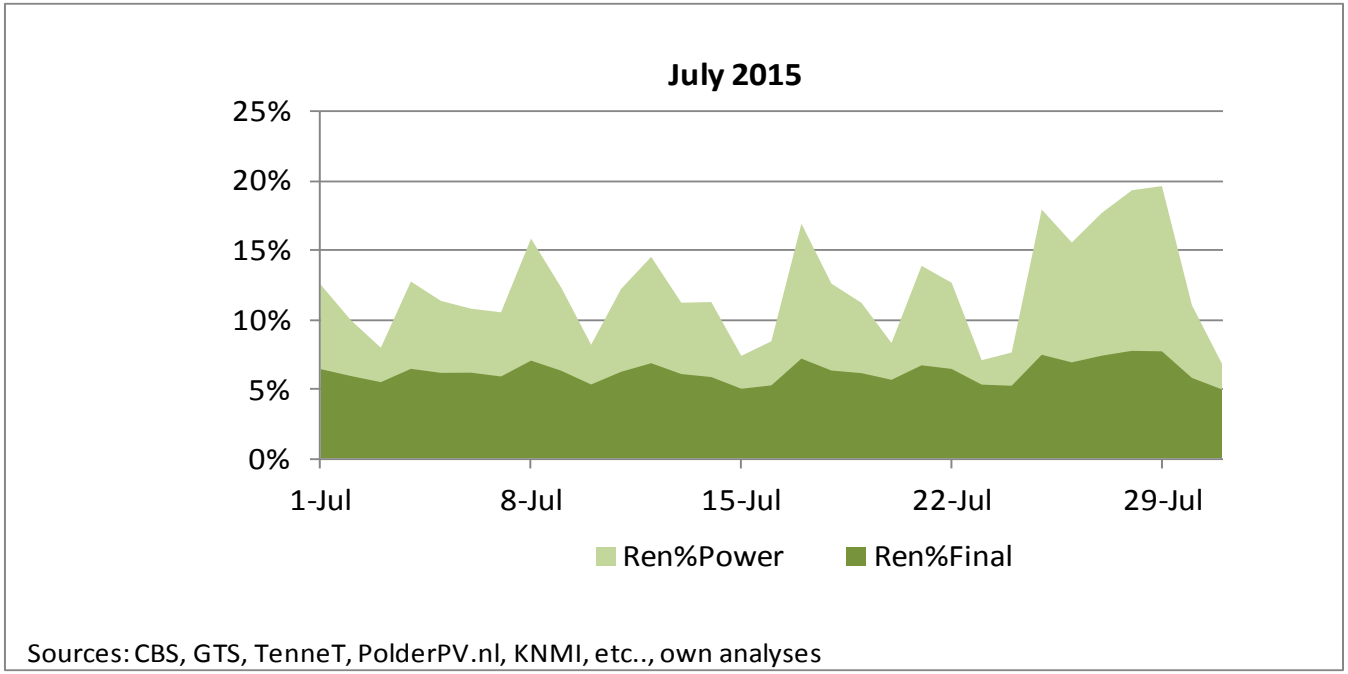

Sources: CBS, GTS, TenneT, PolderPV.nl, KNMI, etc.., own analyses

Renewable energy as a fraction of final energy consumption peaked at 7.7% on July 29th, while the fraction of renewable power peaked to 19% that day.

SELECTED MONTHLY ENERGY DATA

Gas Demand
(excluding gas-to-power)
2015 (and 2014)

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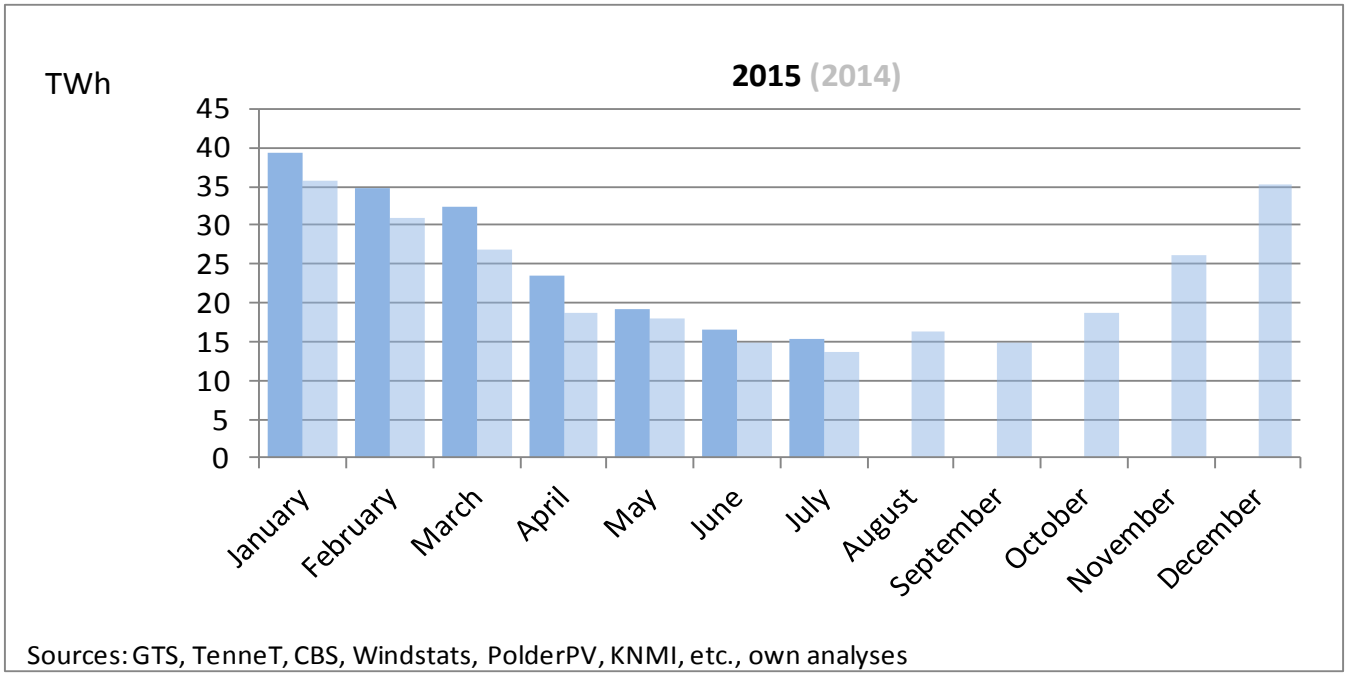
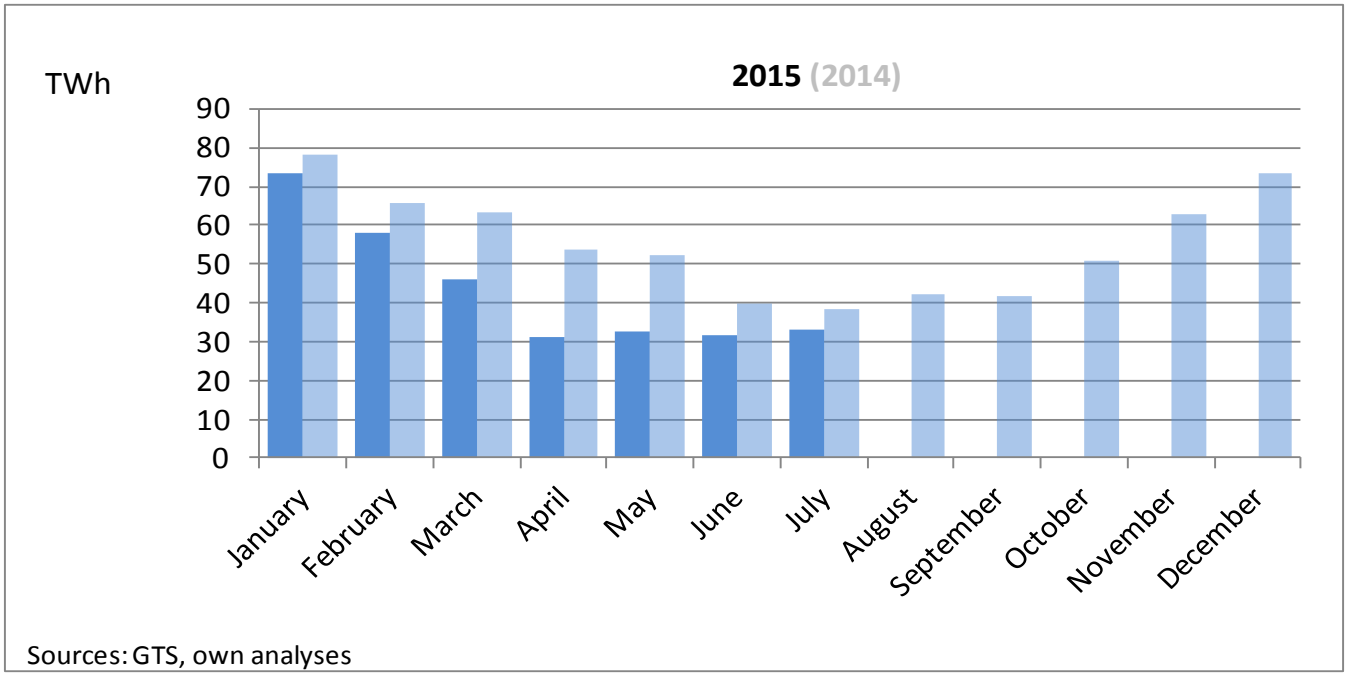


Sources: GTS, TenneT, CBS, Windstats, PolderPV, KNMI, etc., own analyses

Each month in 2015, gas demand, excluding gas-to-power, has been higher than in in the same month in 2014, due to lower temperatures in 2015 compared to 2014, and also higher usage in industry.

Gas Production 2015 (and 2014)



Sources: GTS, own analyses

Due to lower production from the Groningen gas field and declining gas production from the North Sea, Dutch gas production in 2015 is considerable lower than in 2014.

10 TWh gas is sufficient to supply heat to all houses in Amsterdam for two years

Power Demand 2015 (and 2014)

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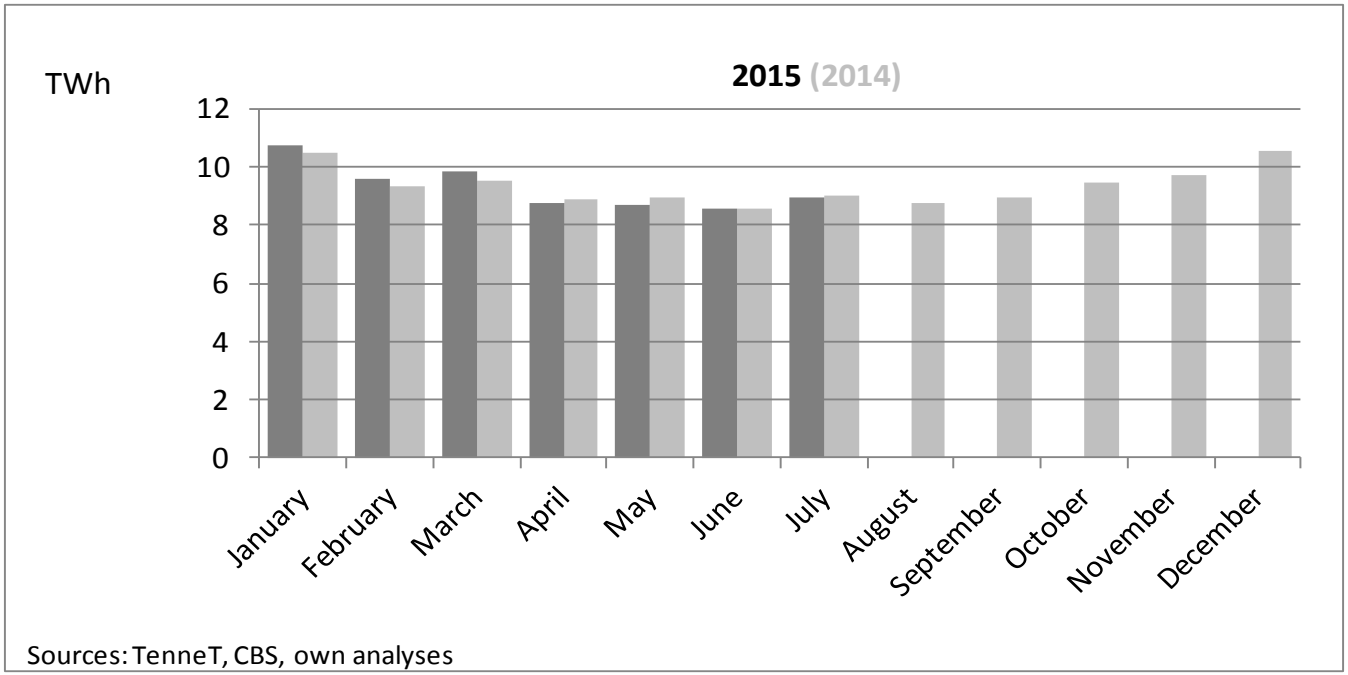
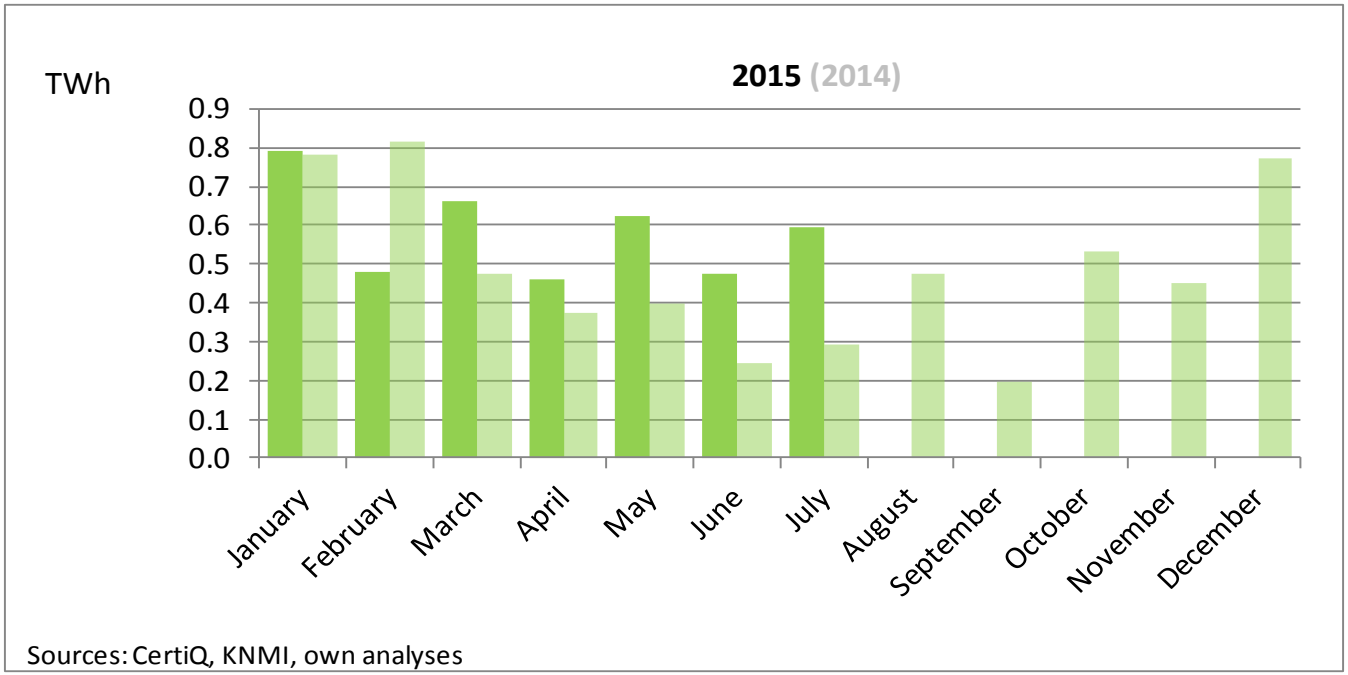


Sources: TenneT, CBS, own analyses

Power demand in July was the same as last year. In 2015, power demand between January and July have been 1% higher than in 2014.

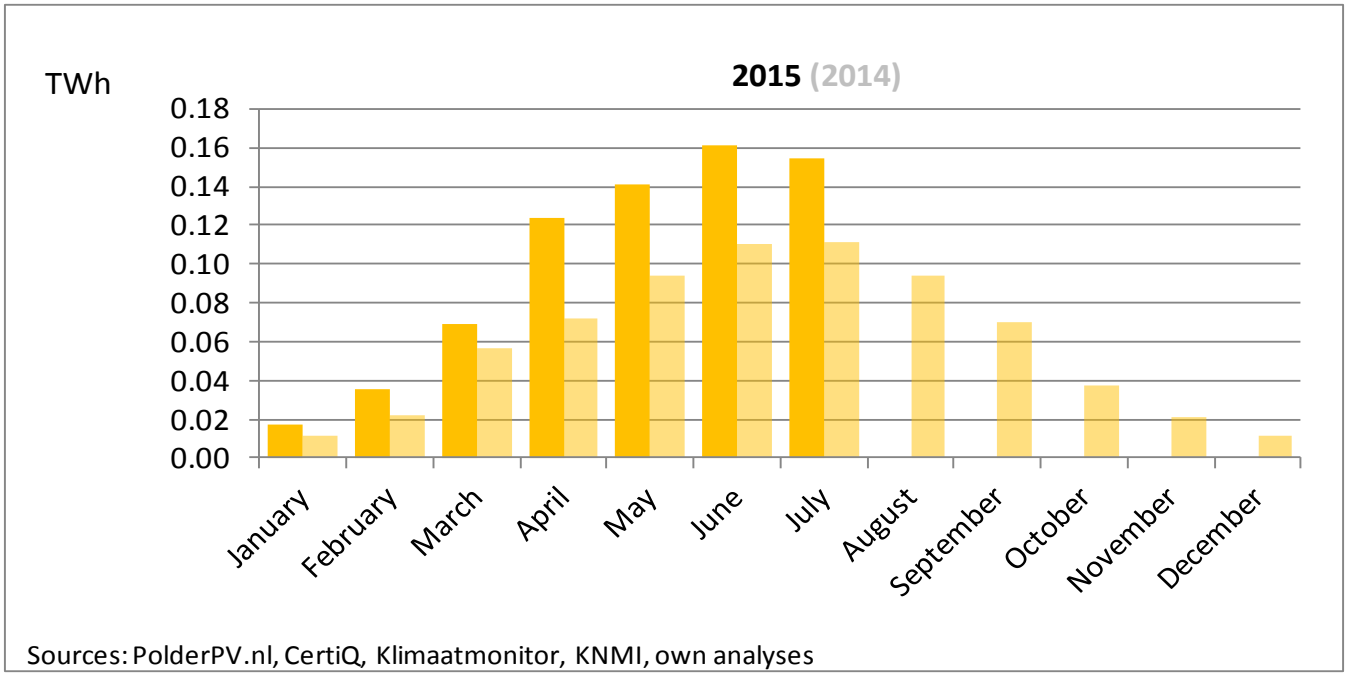
Wind Production 2015 (and 2014)



Sources: CertiQ, KNMI, own analyses

Wind power production is very volatile. Wind production in July 2015 was 94%, mainly much more wind availability. In July 2015, the average utilization of wind capacity was 25%.

Solar PV Production 2015 (and 2014)



Sources: PolderPV.nl, CertiQ, Klimaatmonitor, KNMI, own analyses

In July 2015, electricity production by Solar PV in The Netherlands was slightly less than the record level in June. In July 2015, the average utilization rate of solar-PV capacity was 17%.

Coal-to-Power 2015 (and 2014)

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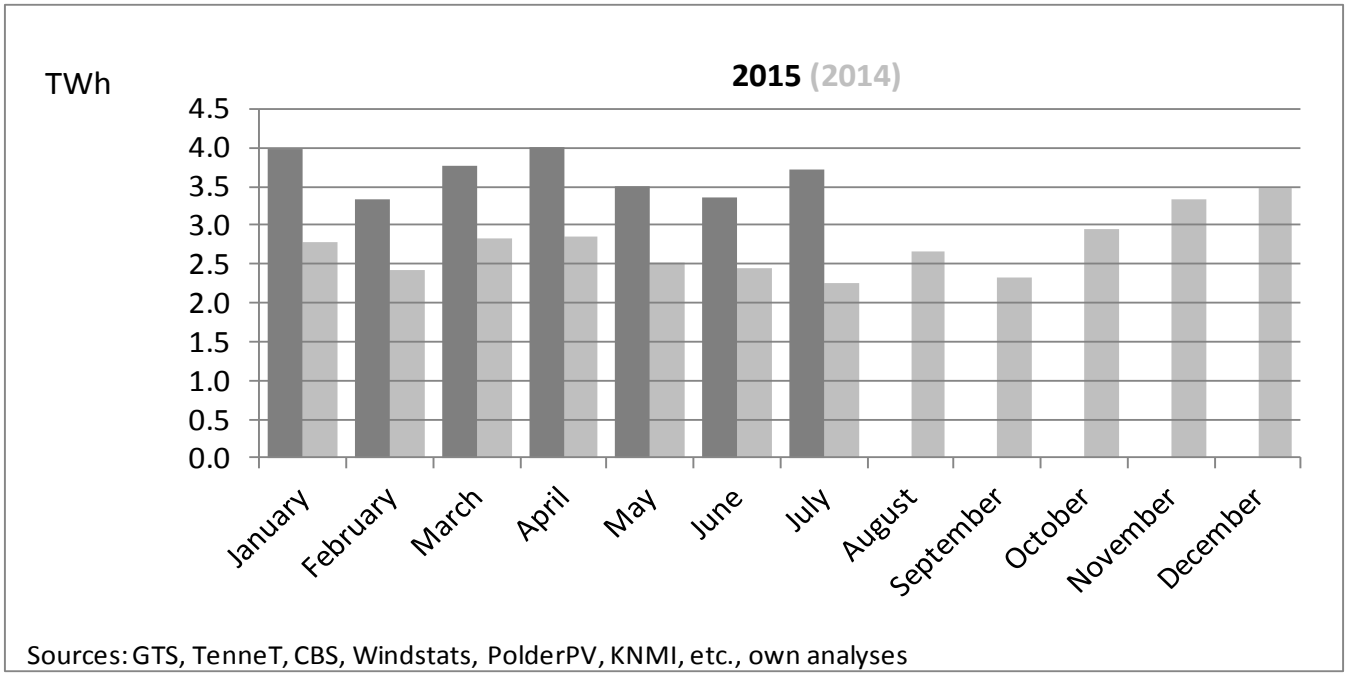

Sources: GTS, TenneT, CBS, Windstats, PolderPV, KNMI, etc., own analyses

Coal utilization for power generation is structurally about 35% higher in 2015 compared to 2014. In July, the average utilization rate of coal-fired power stations in the Netherlands has been calculated at 70%. This percentage includes the effects of maintenance.

Gas to Power
2015 (and 2014)

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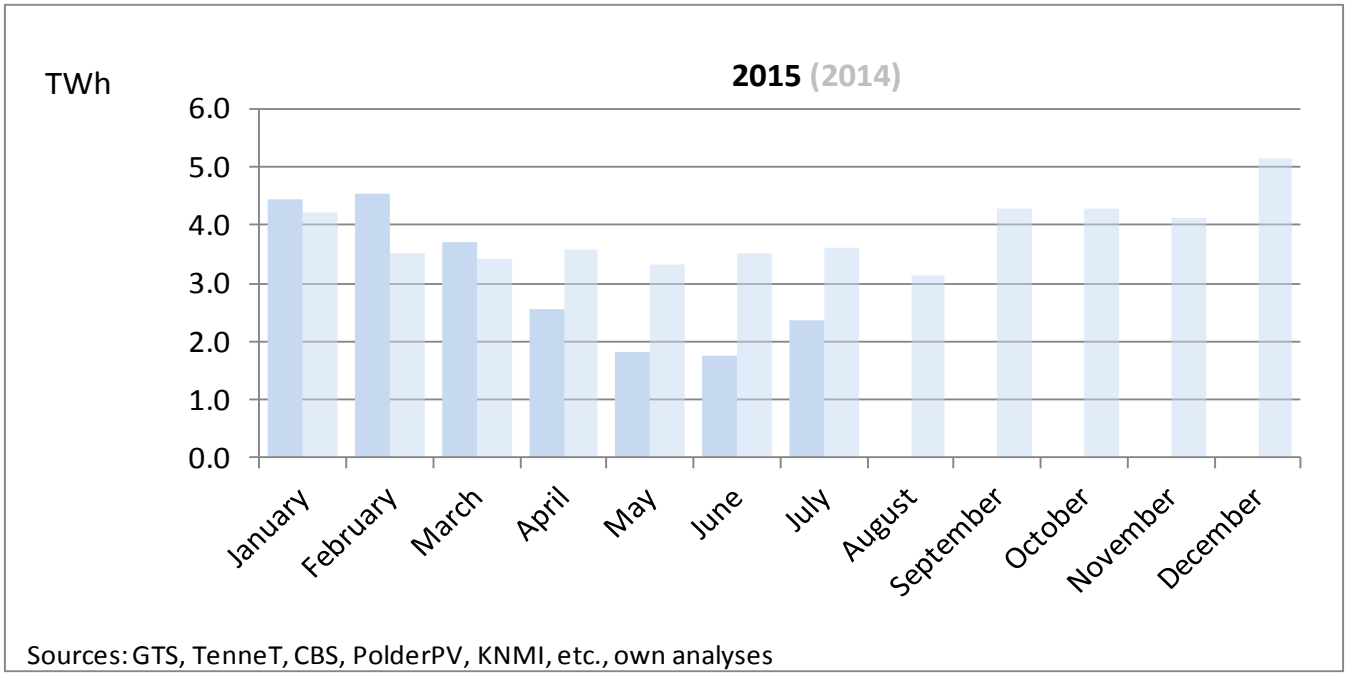
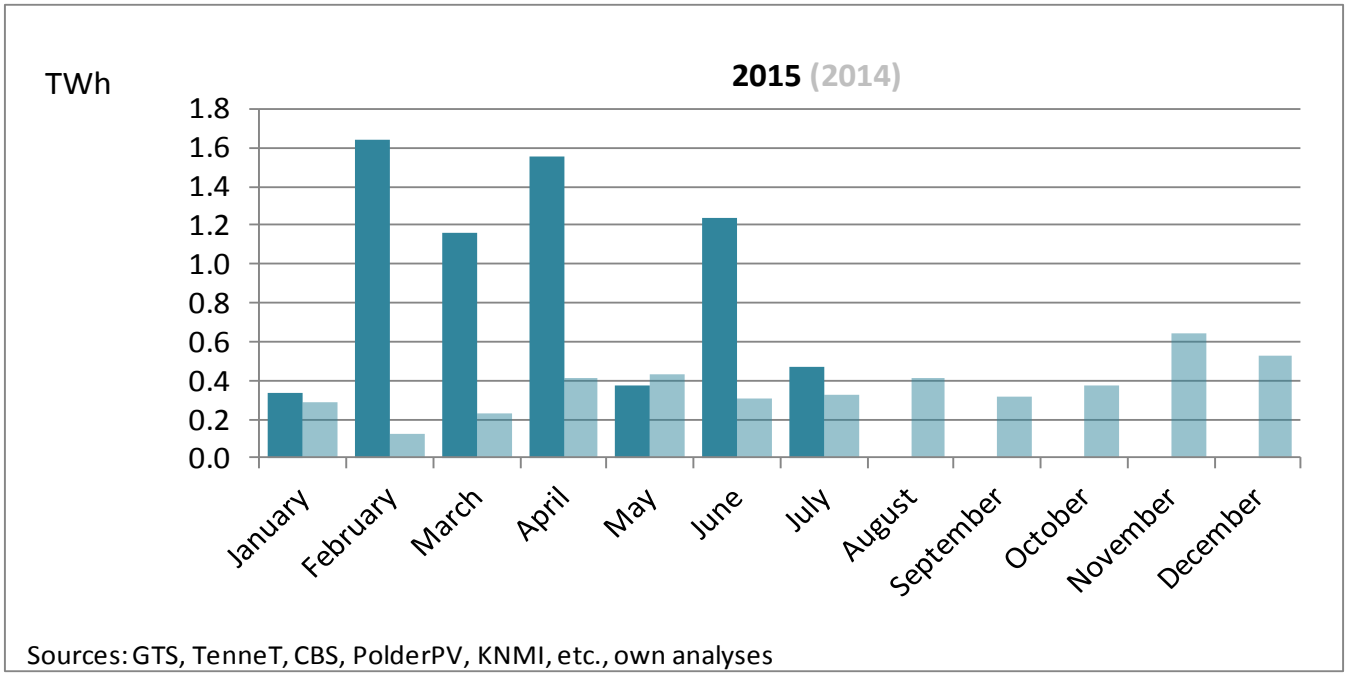


Sources: GTS, TenneT, CBS, PolderPV, KNMI, etc., own analyses

In July 2015, power production by gas-fired power stations and cogeneration was less increased slightly compared to June 2015., due to a reduction in net power imports. In July, the average utilization rate of gas-fired capacity was 24%. This percentage includes maintenance and mothballed installations.

LNG imports 2015 (and 2014)



Sources: GTS, TenneT, CBS, PolderPV, KNMI, etc., own analyses

In July 2015, little LNG was imported via LNG terminal. On average, LNG imports in 2015 increased by 200% compared to 2014.

Renewable Energy
All Sources
2015 (and 2014)

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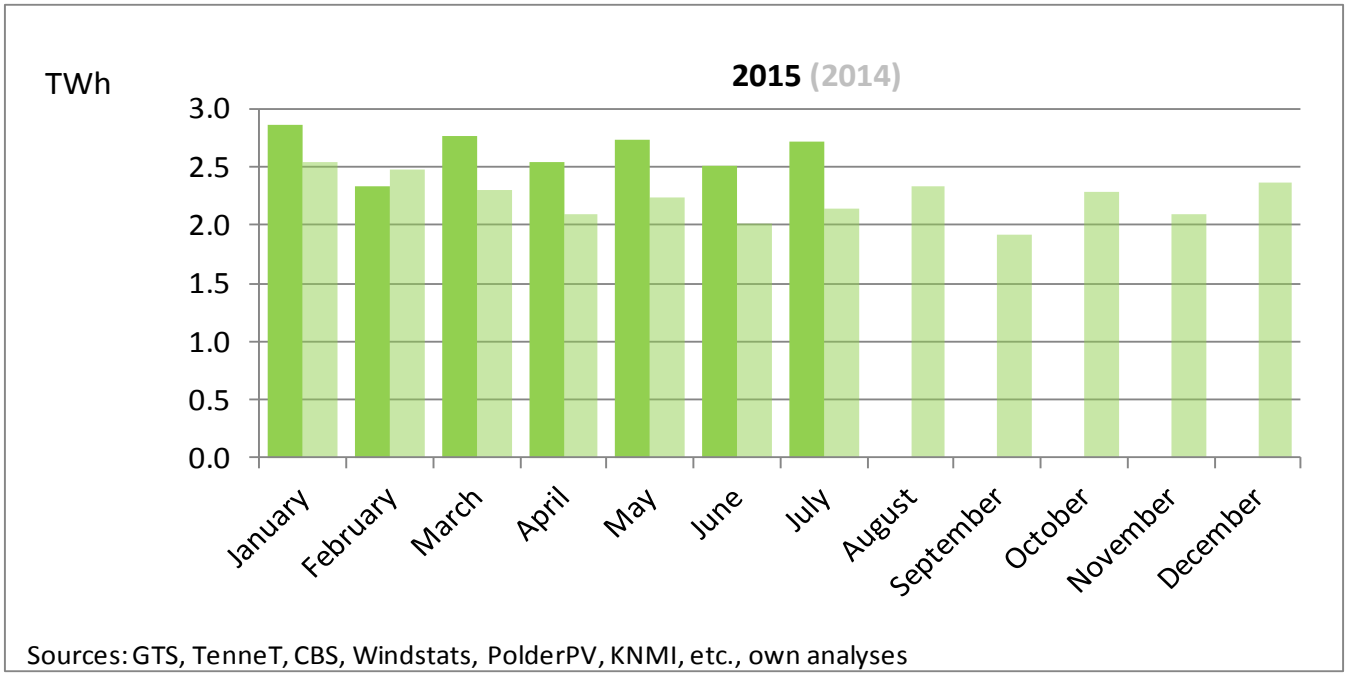

Sources: GTS, TenneT, CBS, Windstats, PolderPV, KNMI, etc., own analyses

In June, the Dutch National Statistical Office (CBS) released a report stating that the utilization of biomass ('wood') by households was significantly underestimated. Moreover, new (higher) data for the usage of bio-oil became available for 2014. The data for 2014 (and 2015) have been adjusted using this new information.

Renewable Energy Percentage 2015 (and 2014)

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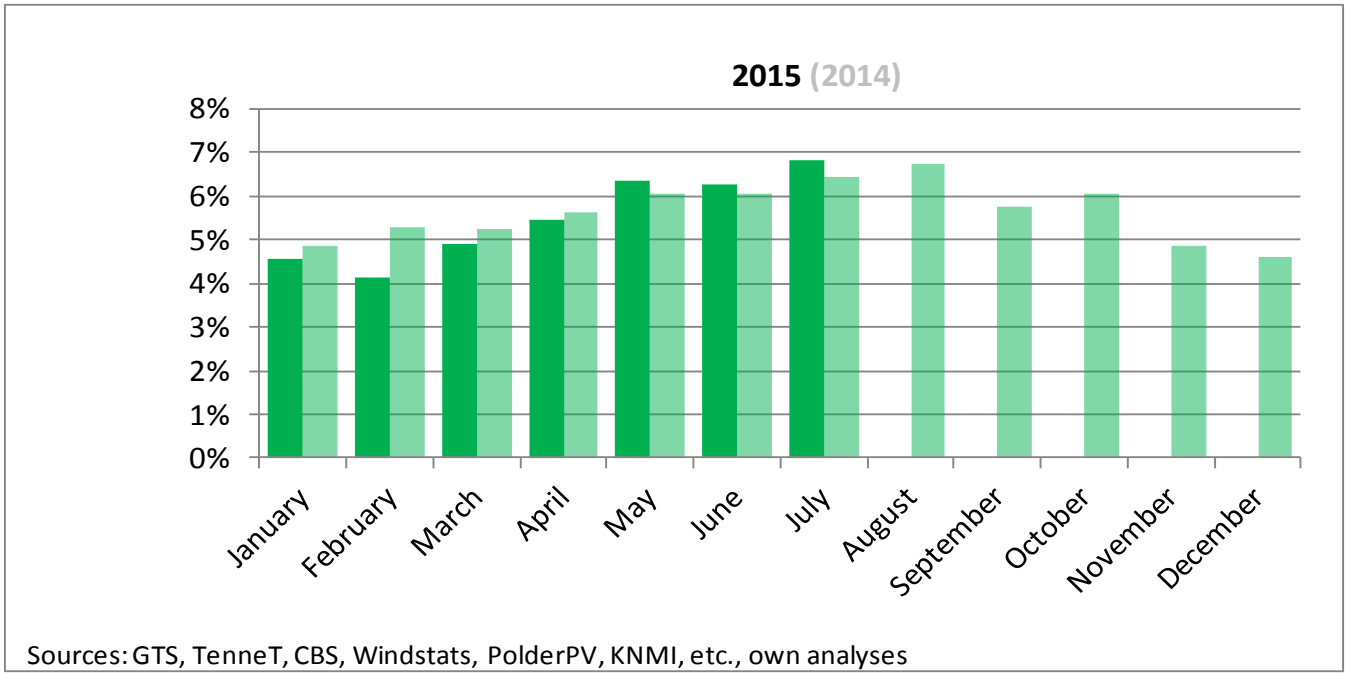

Sources: GTS, TenneT, CBS, Windstats, PolderPV, KNMI, etc., own analyses

The calculation of the percentage of renewable energy for The Netherlands, as fraction of final energy demand (EU definition), has been adjusted this month, taking into account the estimates of the Dutch Statistical Office about the usage of gas, coal and electricity for non-energy purposes. The effect is a 10% (relative) higher estimate for the percentage of renewable energy.

CO2 Emissions 2015 (and 2014)

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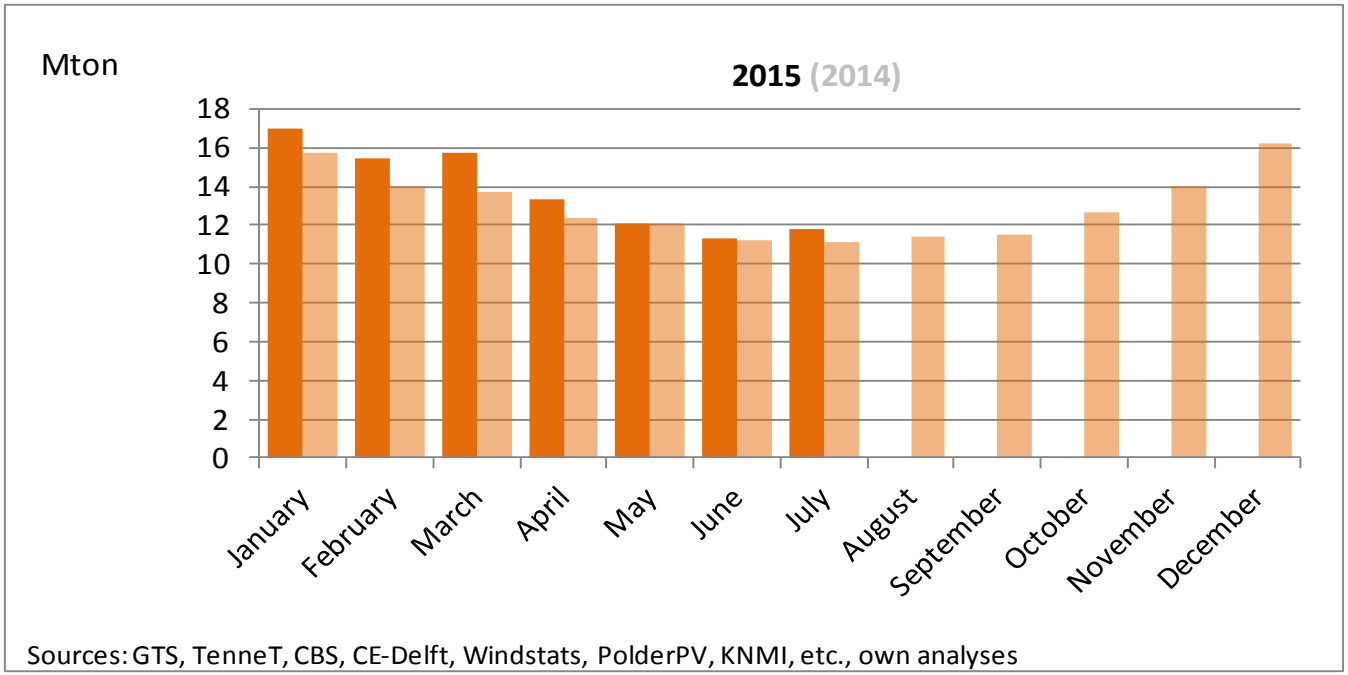
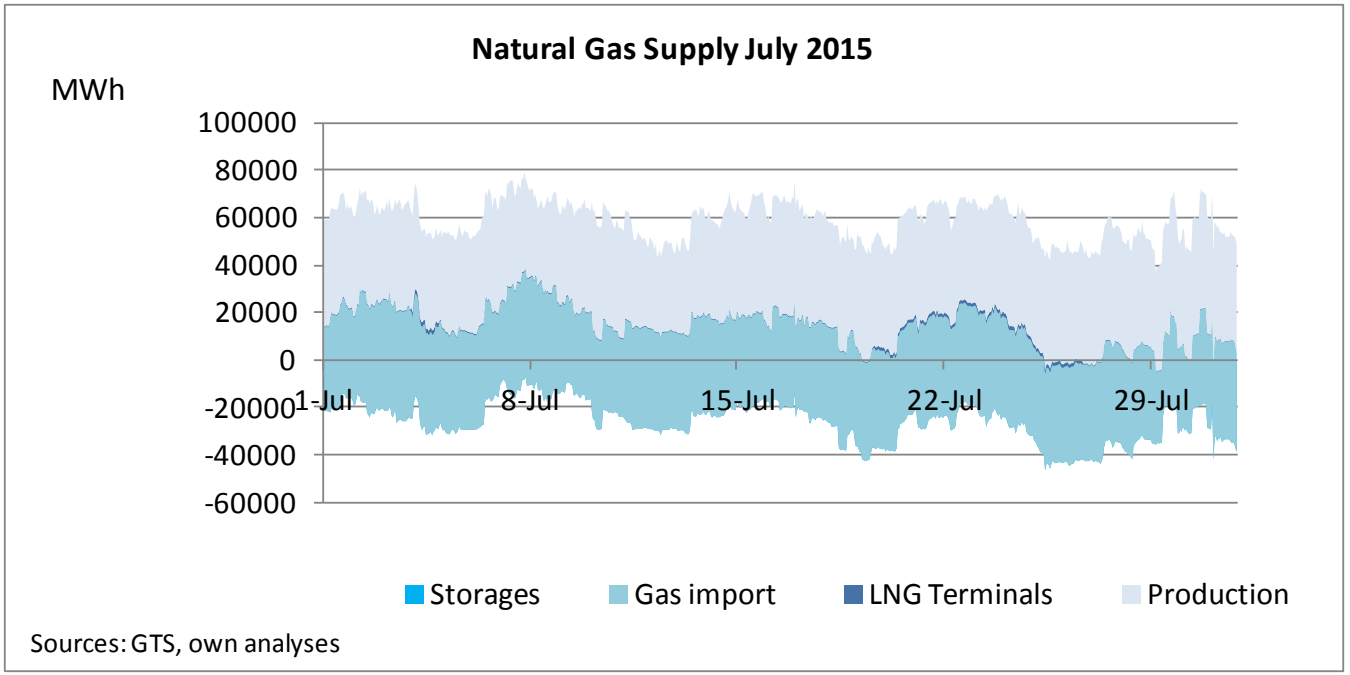


Sources: GTS, TenneT, CBS, CE-Delft, Windstats, PolderPV, KNMI, etc., own analyses

In July 2015, Dutch national CO2 emissions were at the same level as last year. The effect of larger amounts of renewables has been compensated by a higher utilization of coal to generate power less power imports.

SELECTED HOURLY ENERGY DATA

Gas Supply July 2015



In July 2015, substantial gas volumes were used to fill gas storages, depicted as negative values in the figure.

Gas Demand
Including Gas-to-Power
July 2015

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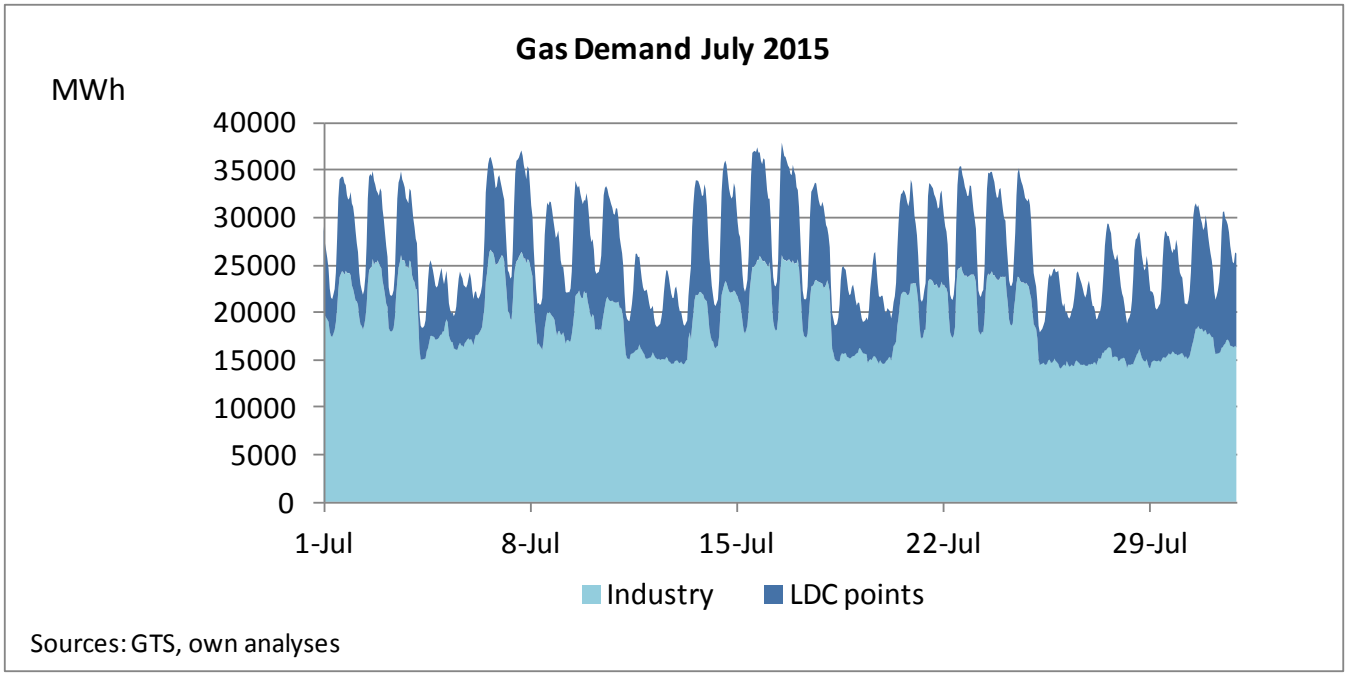
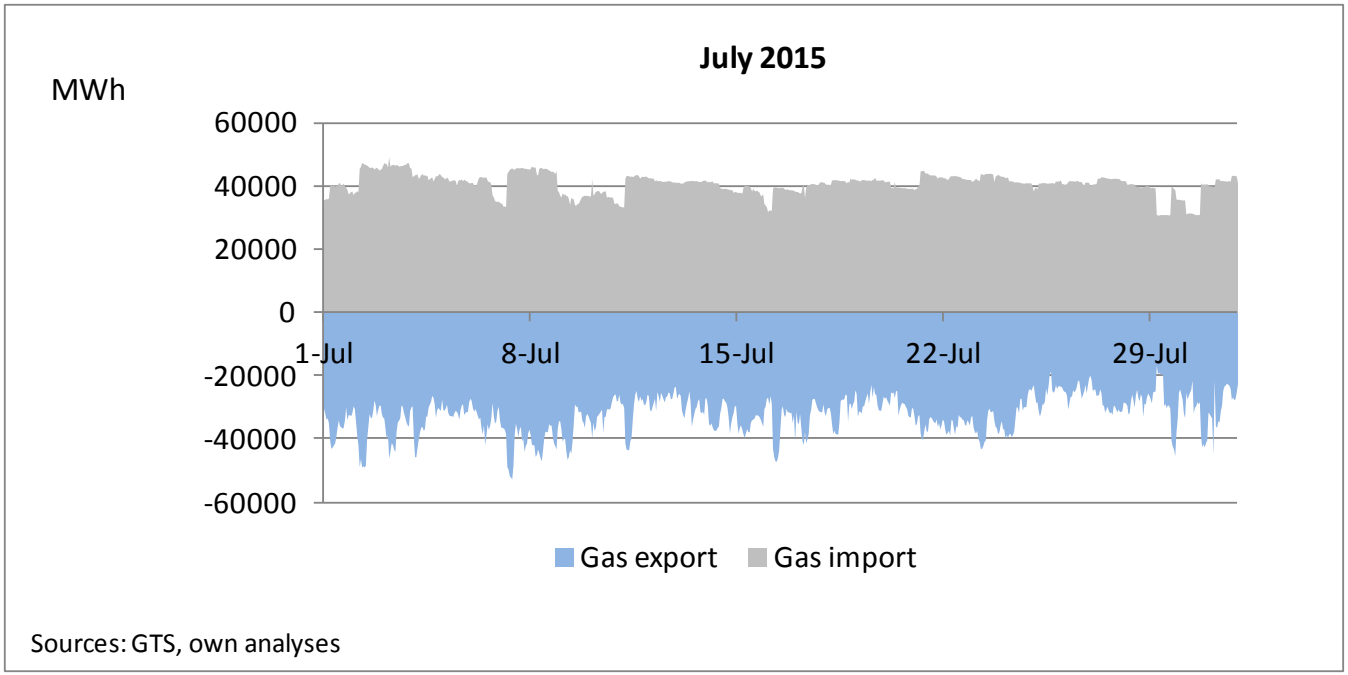


In July, gas demand in The Netherlands peaked to 36000 MW

Gas Imports & Exports July 2015



In July 2015, Dutch gas imports were 6 TWh higher than Dutch gas exports. After May 2015, this was the second time it occurred that the Netherlands was a net importing gas country (on a montlhy basis)

Power Imports & Exports July 2015

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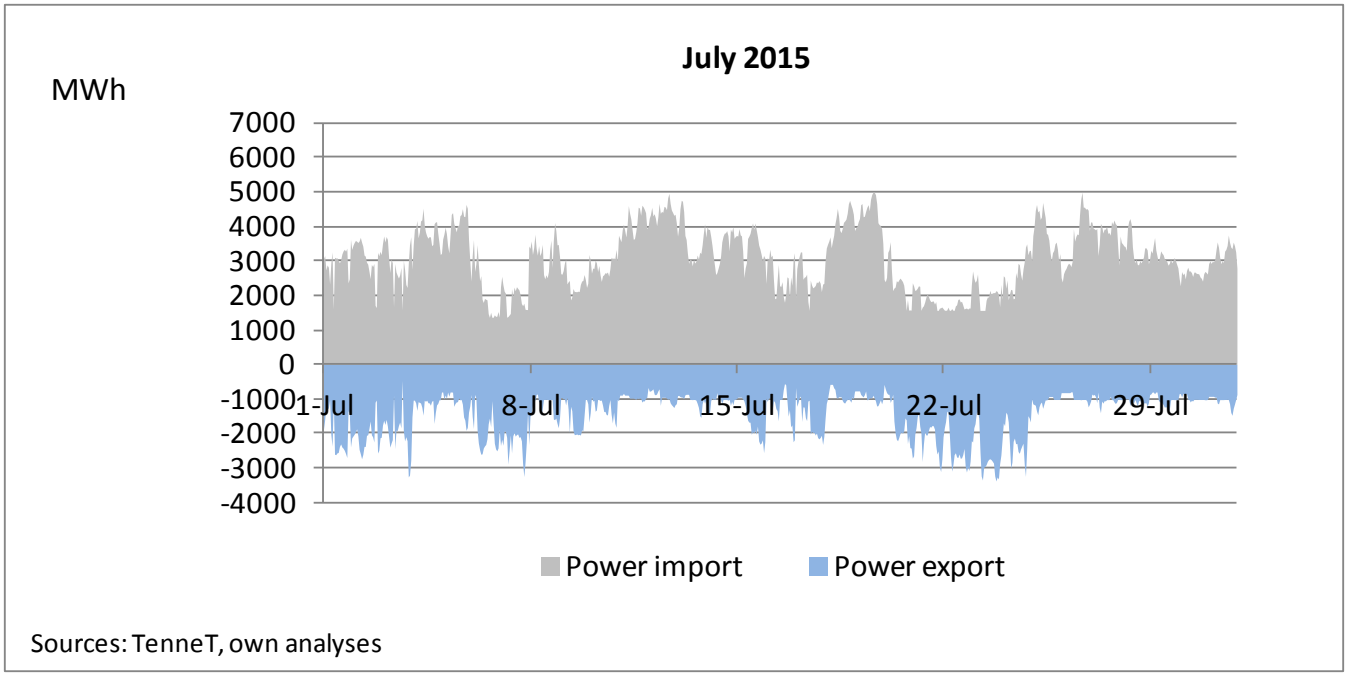
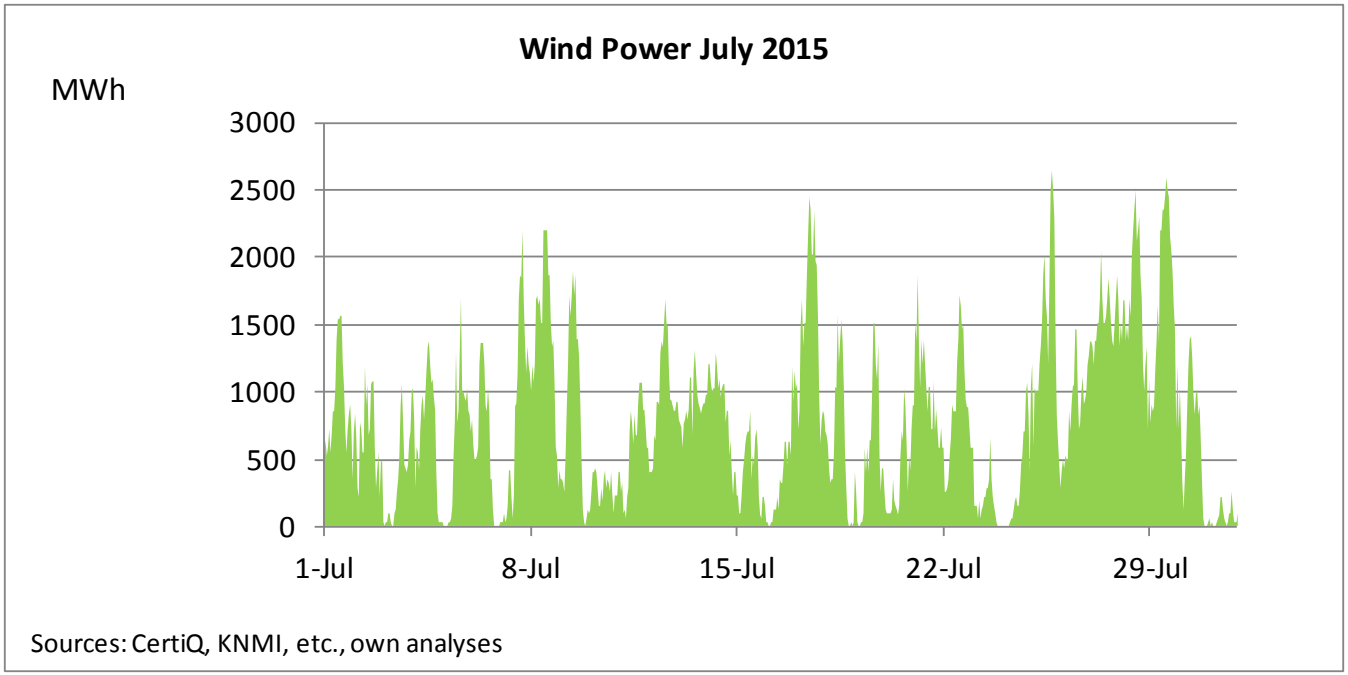


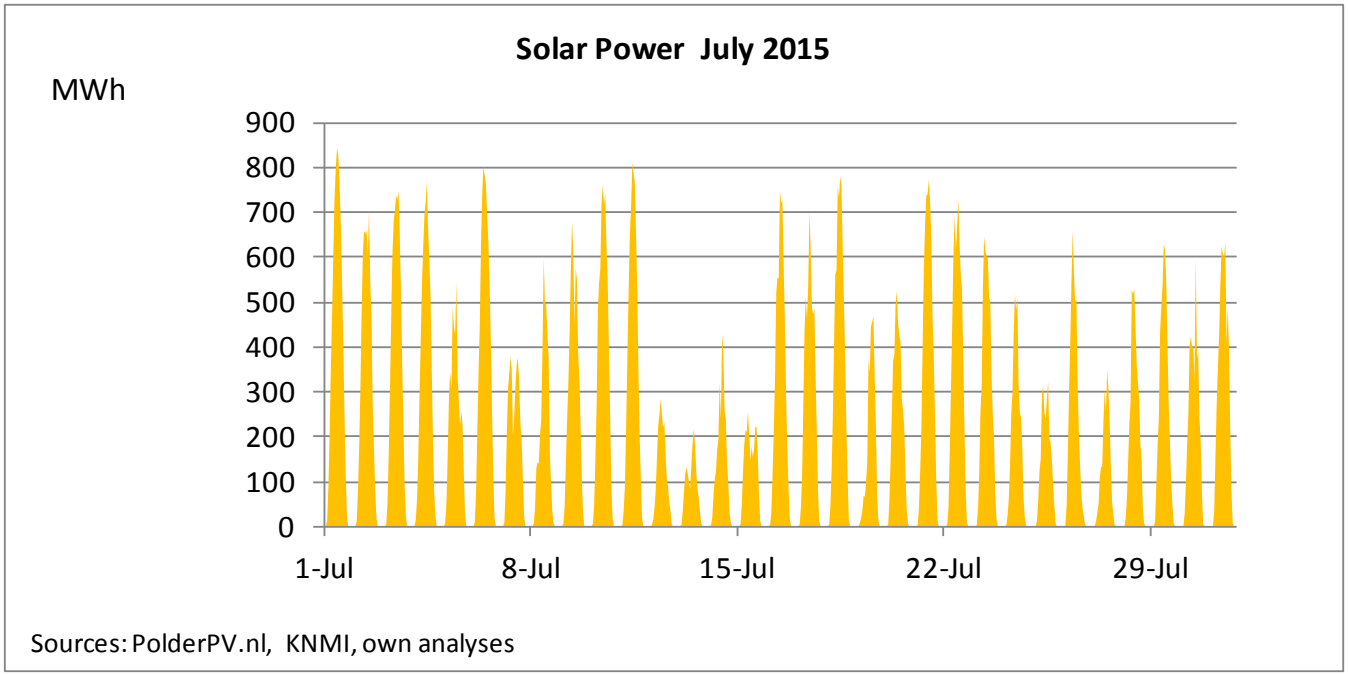
In July 2015, power imports were generally much higher than power exports. The exception have been around the 22nd of July, where power exports exceeded power imports. Typically, the Netherlands imports about 4000 MW of power, while it exports about 1000 MW.

Wind Power July 2015



In The Netherlands, summers are characterized by a low availability of wind. July 2015 has been an exception to this rule, with a lot of wind, resulting in a utilization rate of the available wind capacity of 25%.

Solar PV Power July 2015



In June Solar-PV reached a new Dutch record level of 161 GWh. The amount of Solar-PV in July was slightly less: 155 GWh. In July, the average utilization rate of the solar PV installed was 17%.

The following set of slides presents for each month in 2015 the hourly contributions of various energy sources to total power consumption in The Netherlands.

Power Generation January 2015

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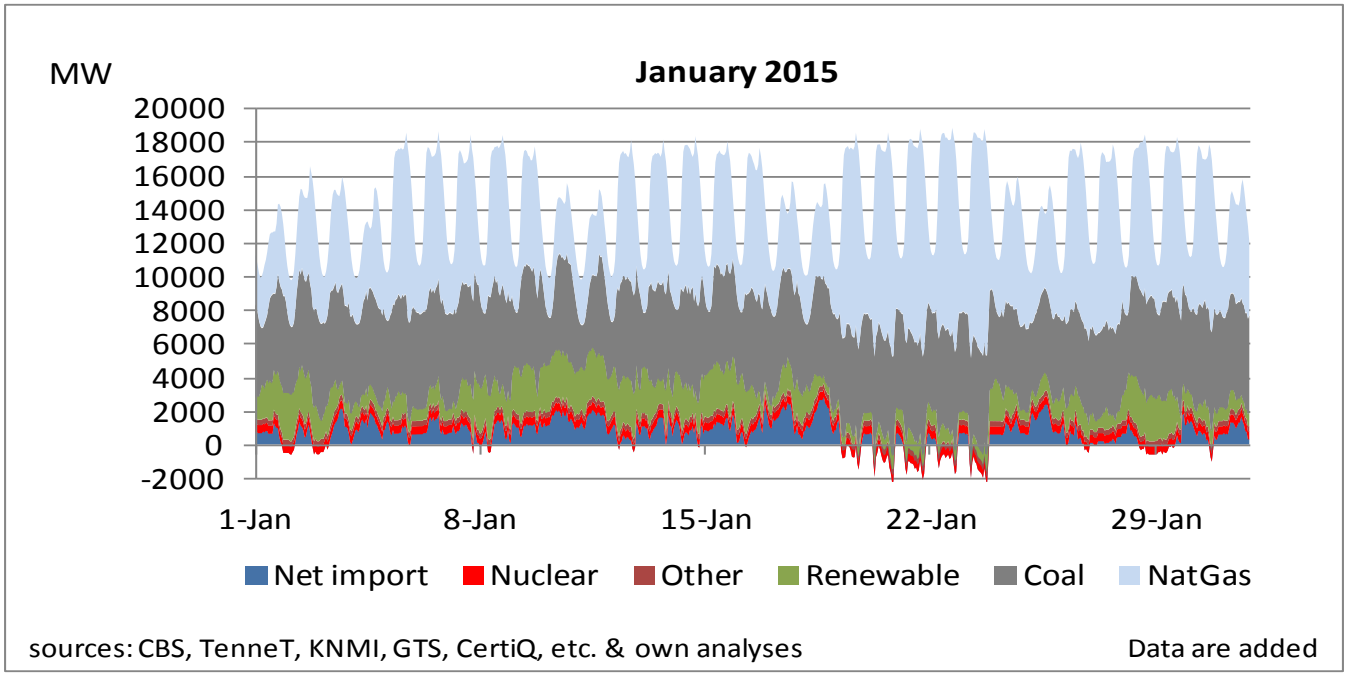
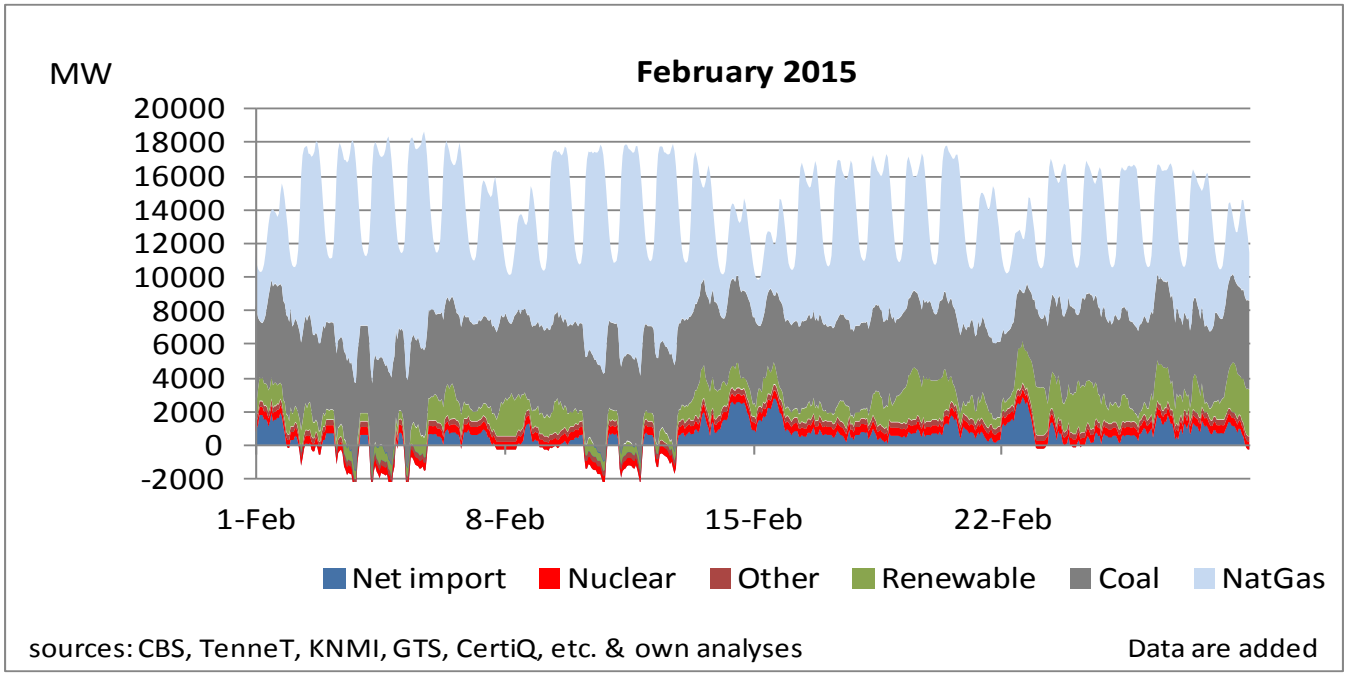


In the week of 20-24 January, power generation peaked, due to the net exports that occurred. The majority of the additional power generation has been generated by gas-fired installations.

Power Generation February 2015



Like in January, low wind availability coincided with net exports of power.

Power Generation March 2015

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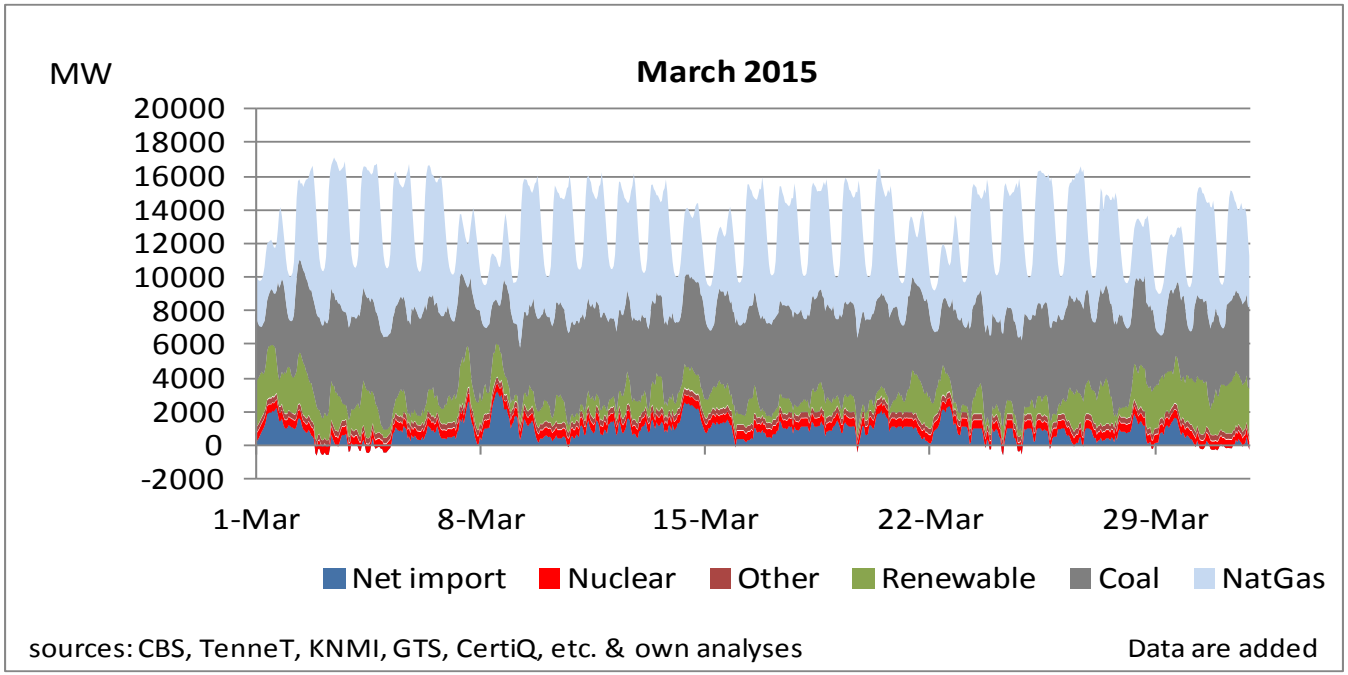

Relatively low imports of power occurred in March. On several Saturdays, some net exports were recorded.

Power Generation
April 2015

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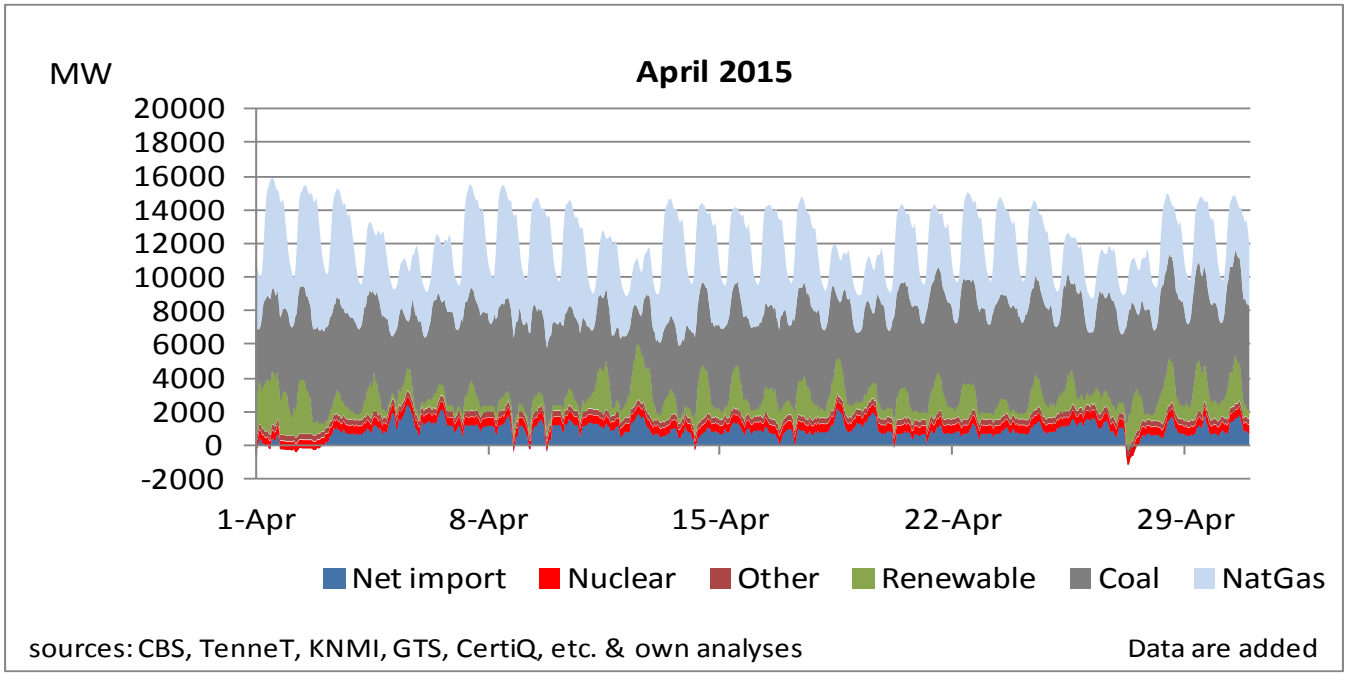
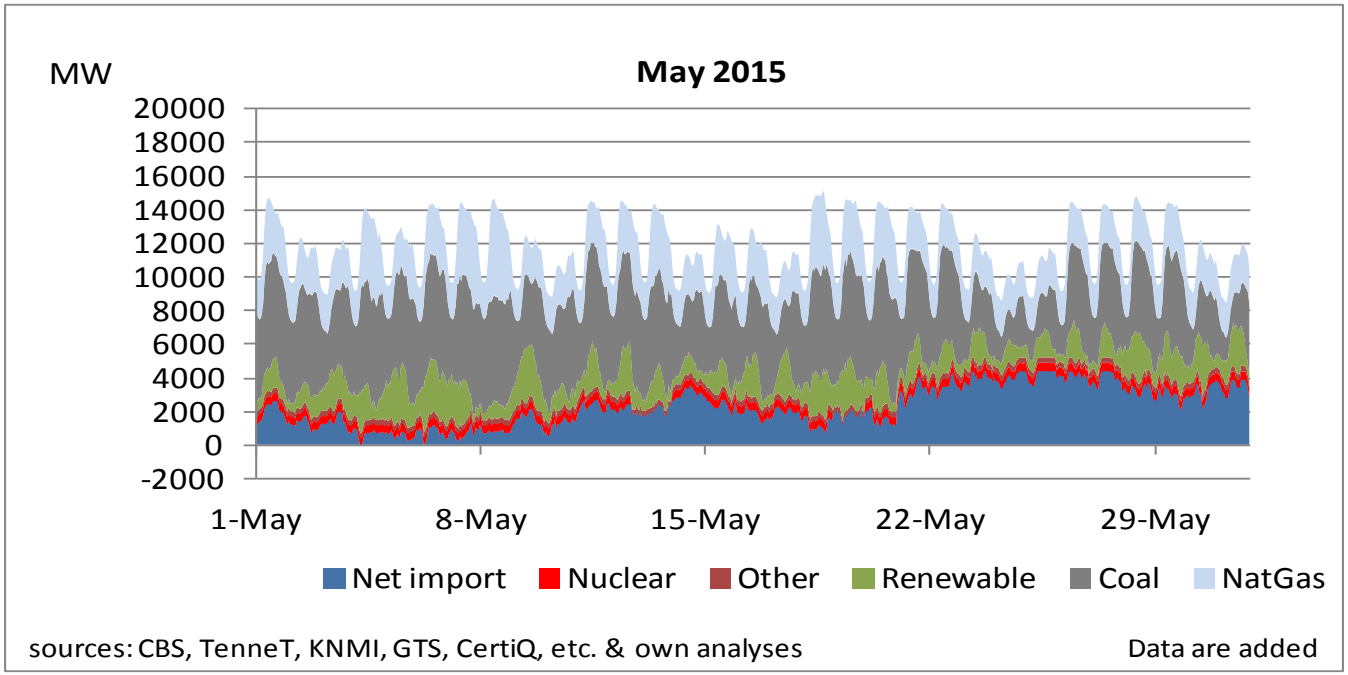


Relatively low imports of power occurred in April. On several occasions, mainly on Saturdays, net exports were recorded. April showed several days with high coal-fired generation, while gas-fired generation was low.

Power Generation May 2015



In May, high net imports and high coal utilization squeezed gas-fired power generation.

Power Generation
June 2015

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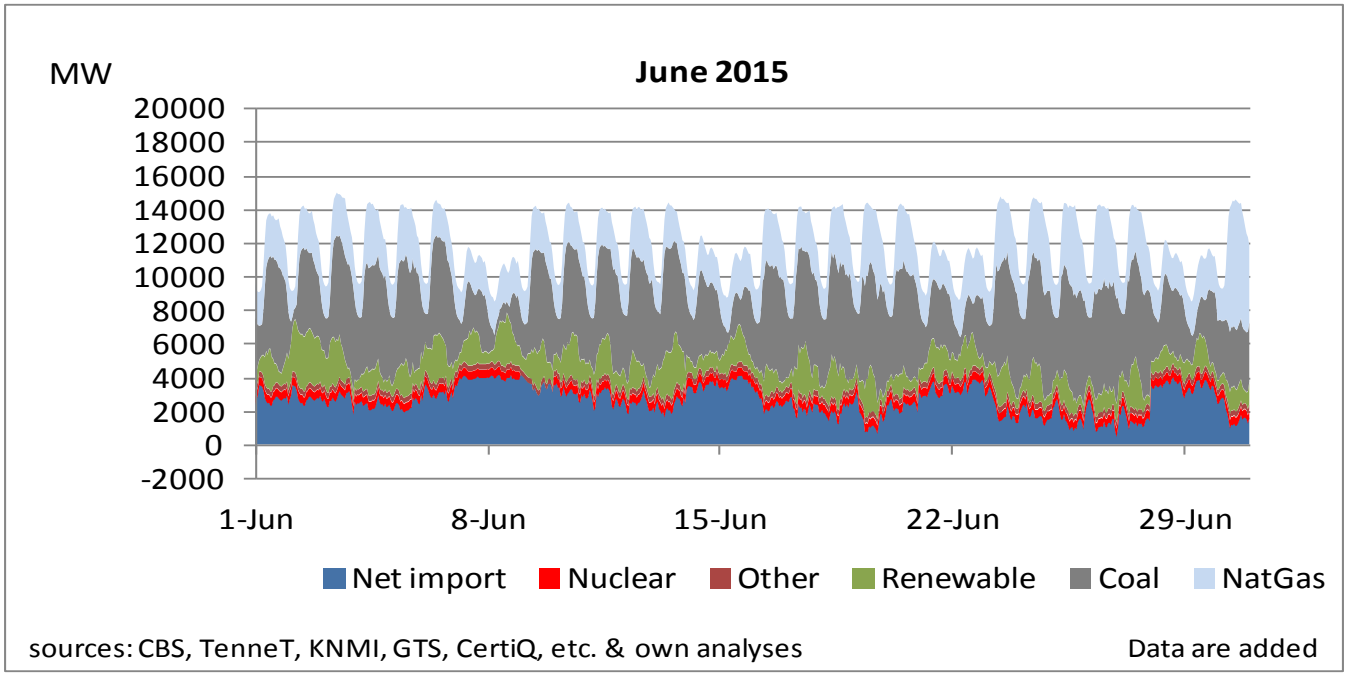
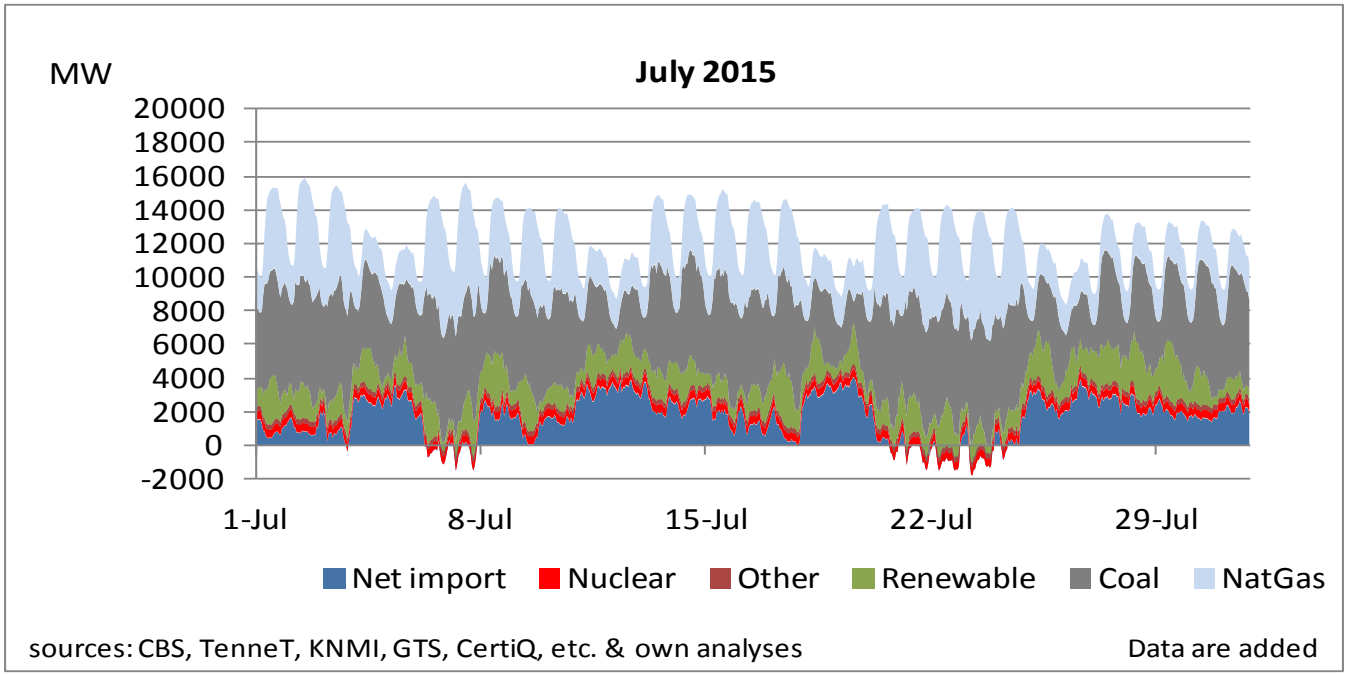


In June, high net imports and high coal utilization squeezed out gas-fired power generation.

Power Generation July2015



In July, imports were more moderate than in June; consequently, although coal utilization remained high, more gas-fired power generation was registered than in June.

The following set of slides presents for each week in 2015 the hourly contributions of wind and solar-PV to the total power consumption in The Netherlands.

Hourly Solar-PV and Wind Generation 2015

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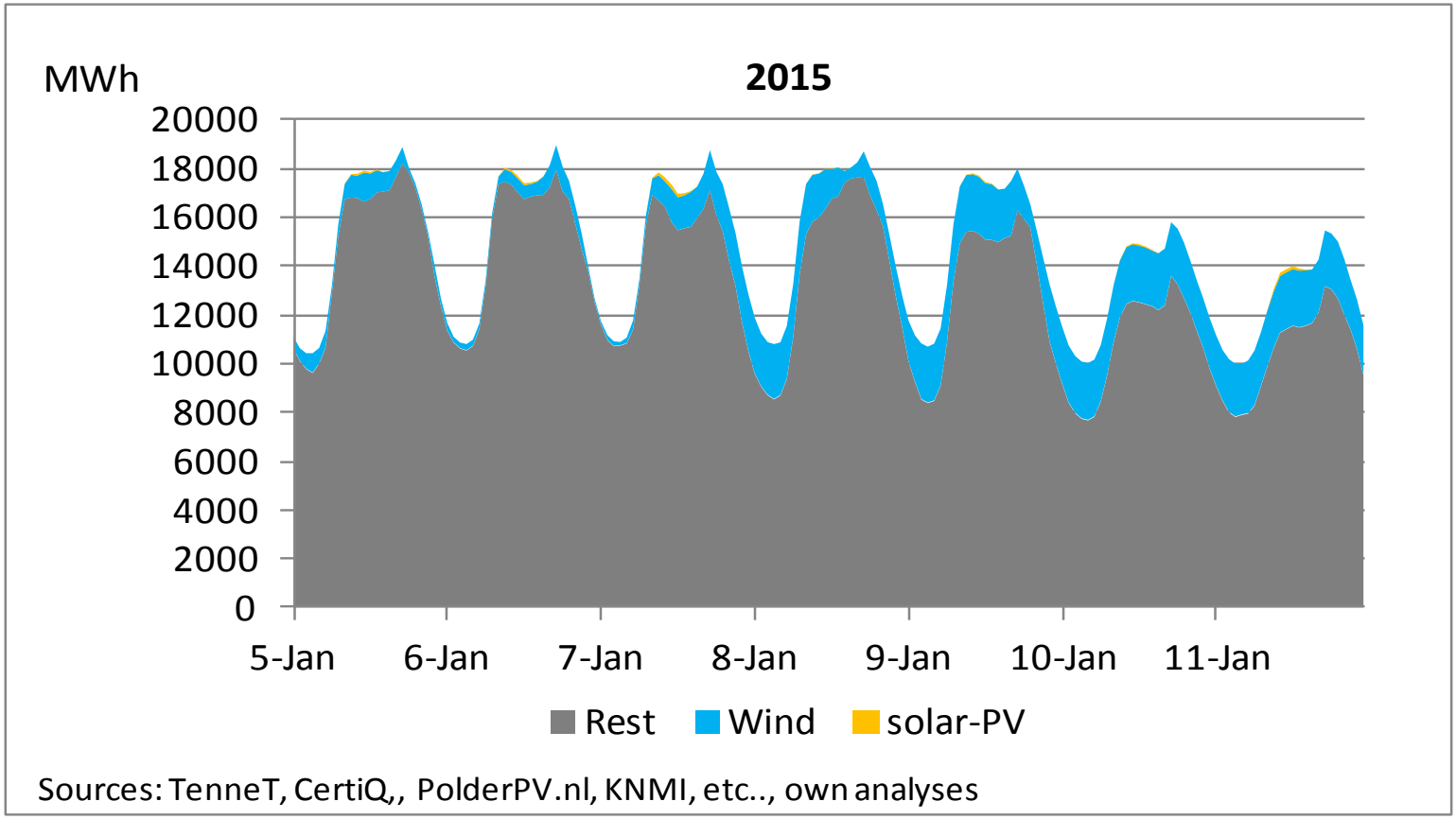

Sources: TenneT, CertiQ,, PolderPV.nl, KNMI, etc.., own analyses

Hourly Solar-PV and Wind Generation 2015

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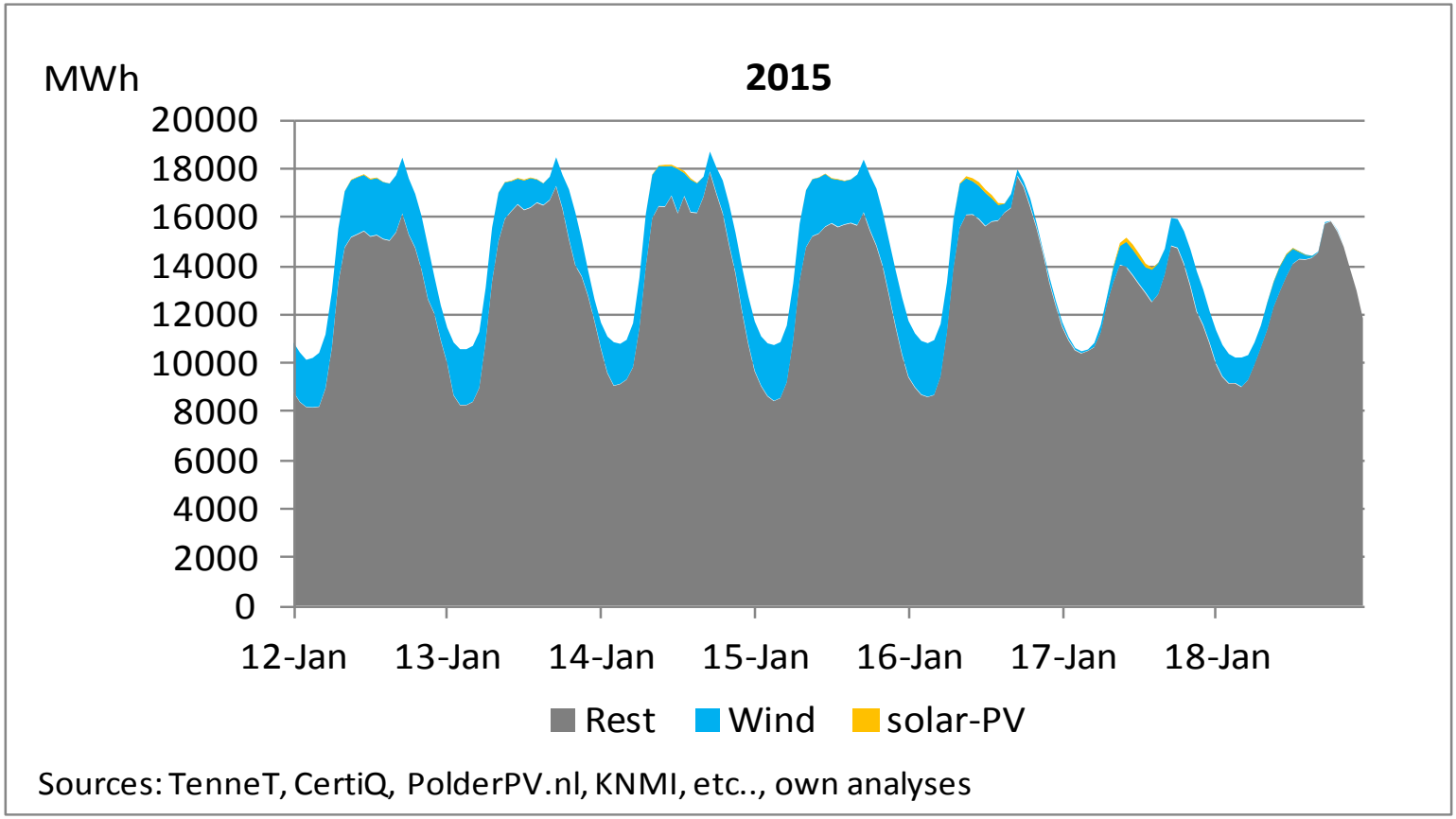

Sources: TenneT, CertiQ, PolderPV.nl, KNMI, etc.., own analyses

Hourly Solar-PV and Wind Generation 2015

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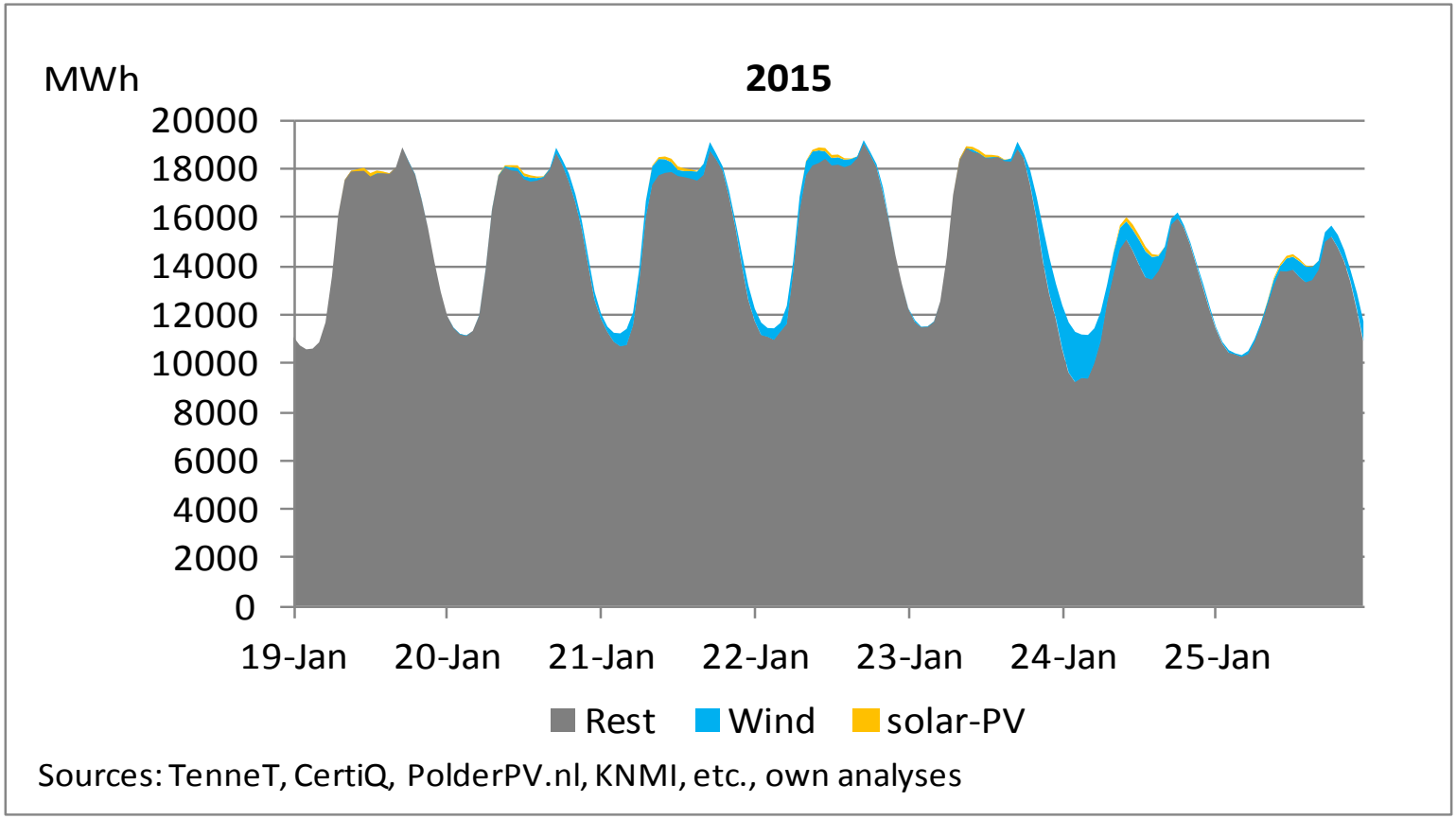

Sources: TenneT, CertiQ, PolderPV.nl, KNMI, etc., own analyses

Hourly Solar-PV and Wind Generation 2015

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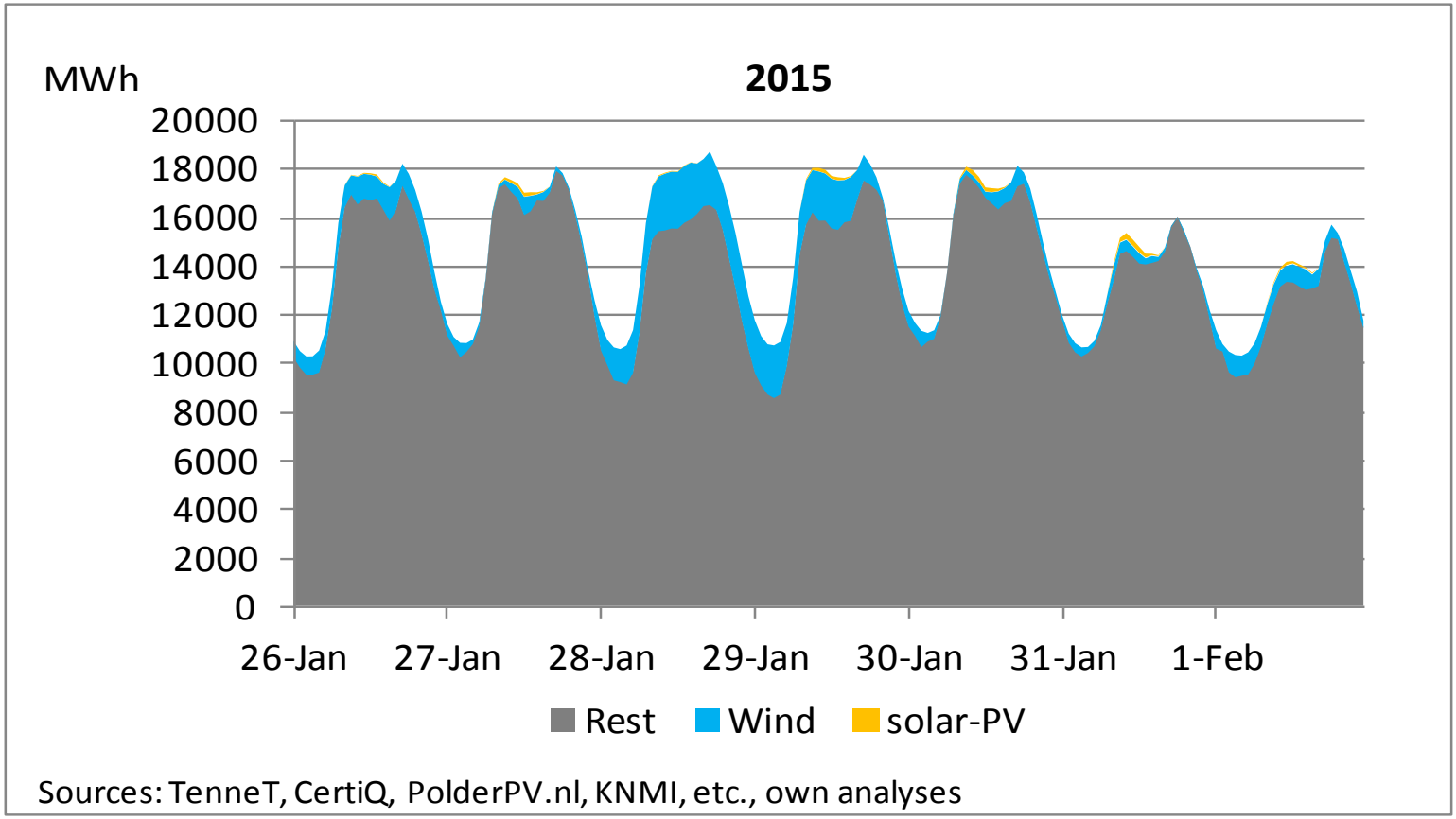

Sources: TenneT, CertiQ, PolderPV.nl, KNMI, etc., own analyses

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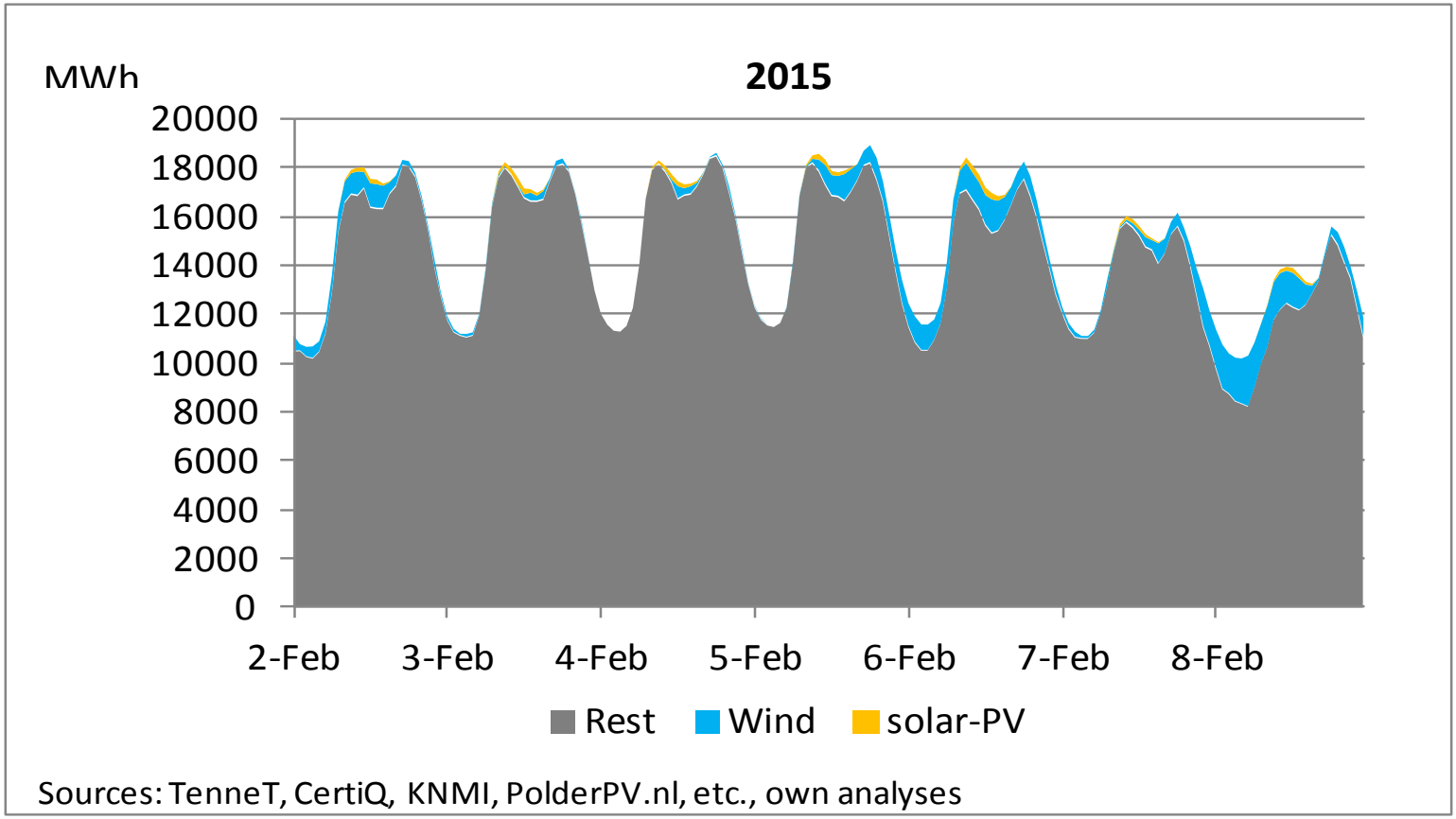

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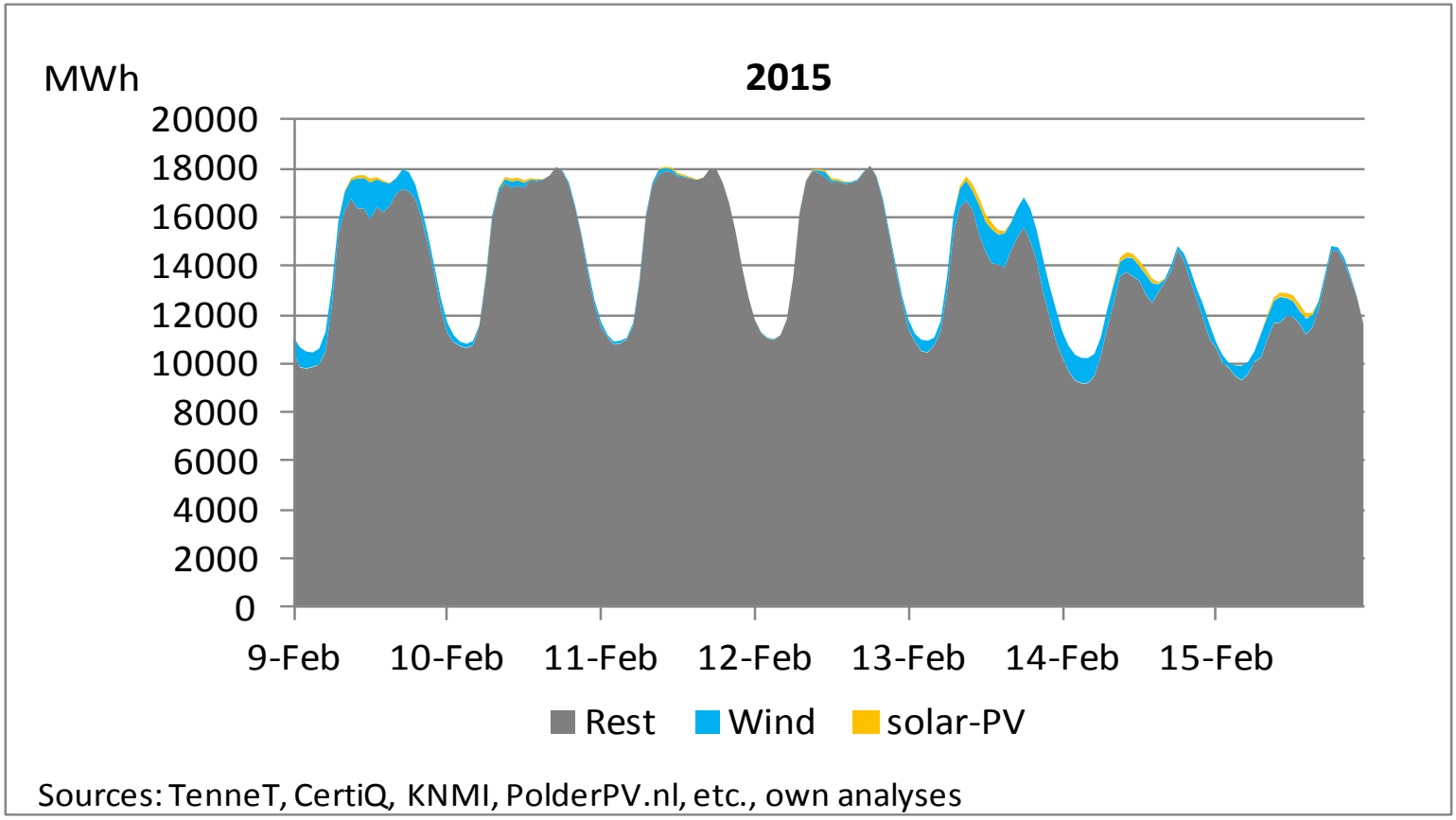

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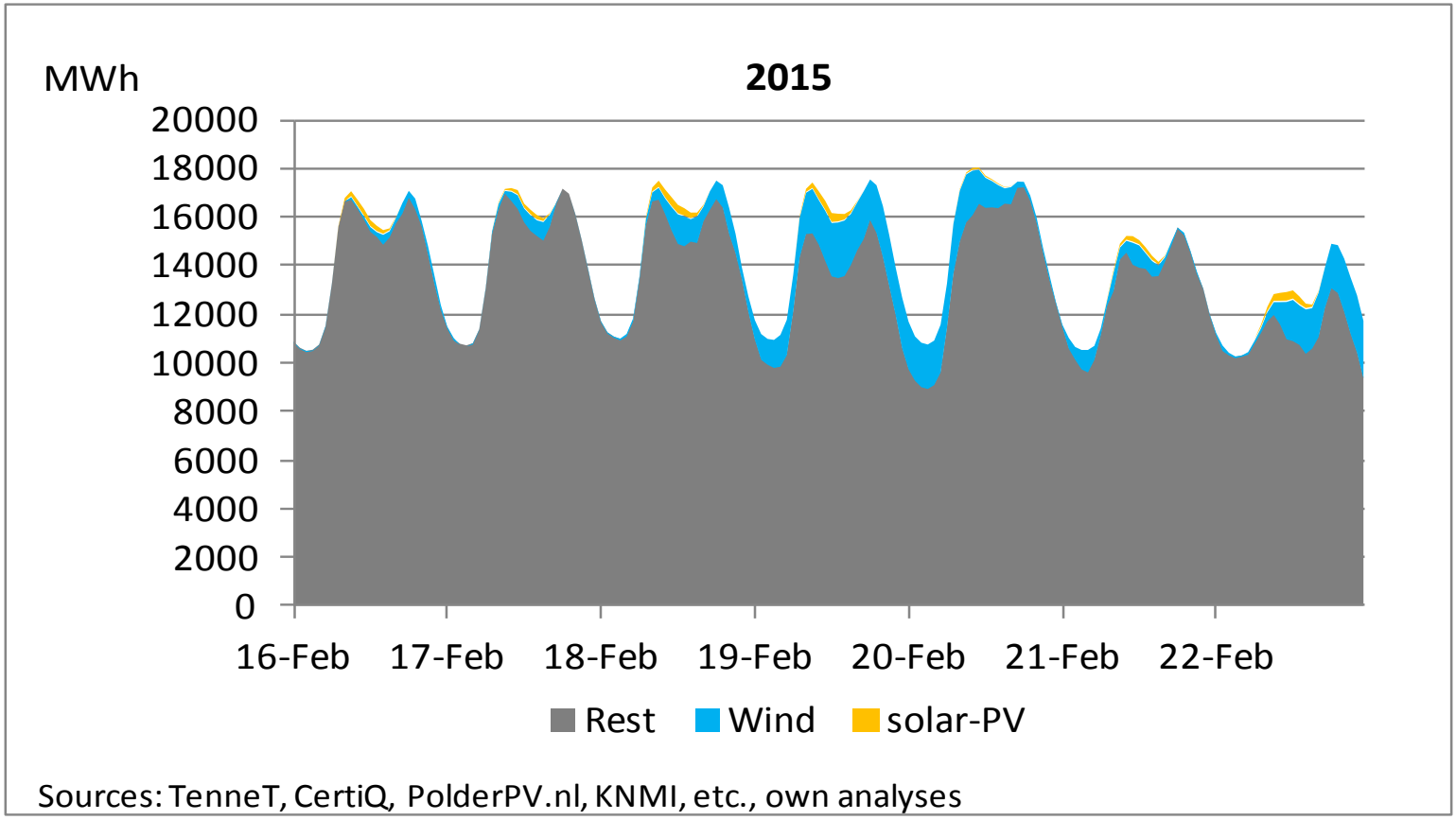

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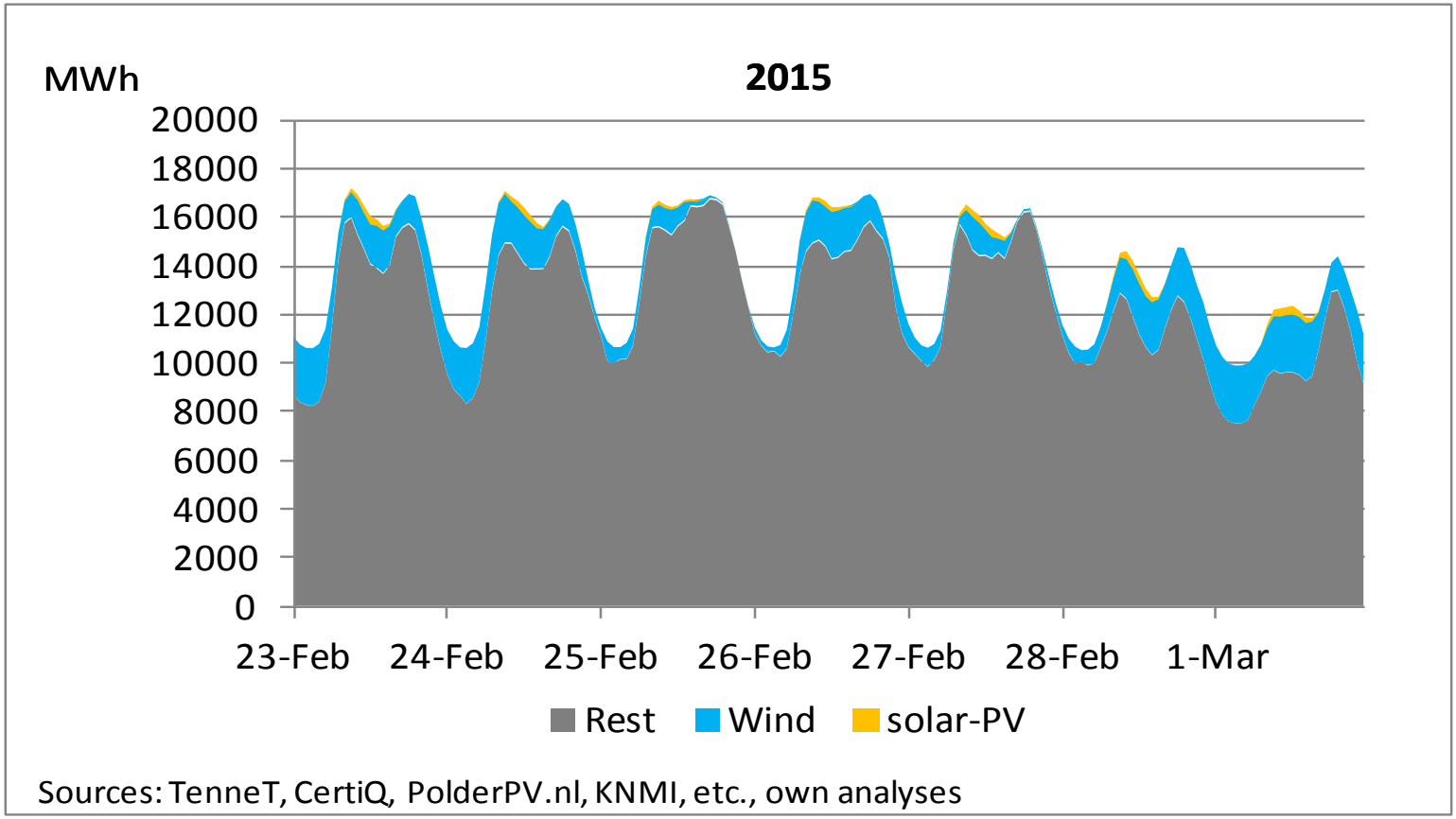

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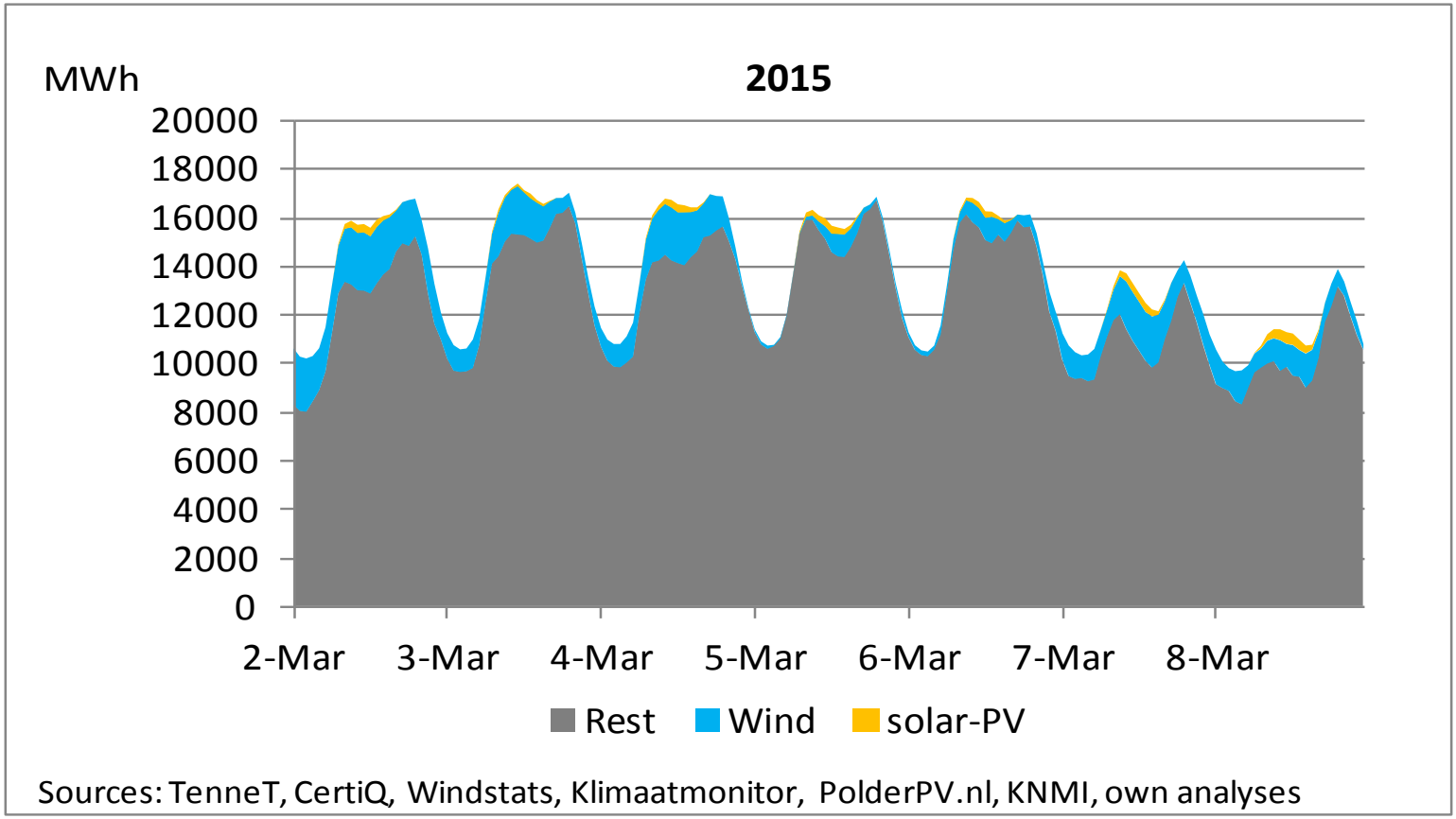

Sources: TenneT, CertiQ, Windstats, Klimaatmonitor, PolderPV.nl, KNMI, own analyses

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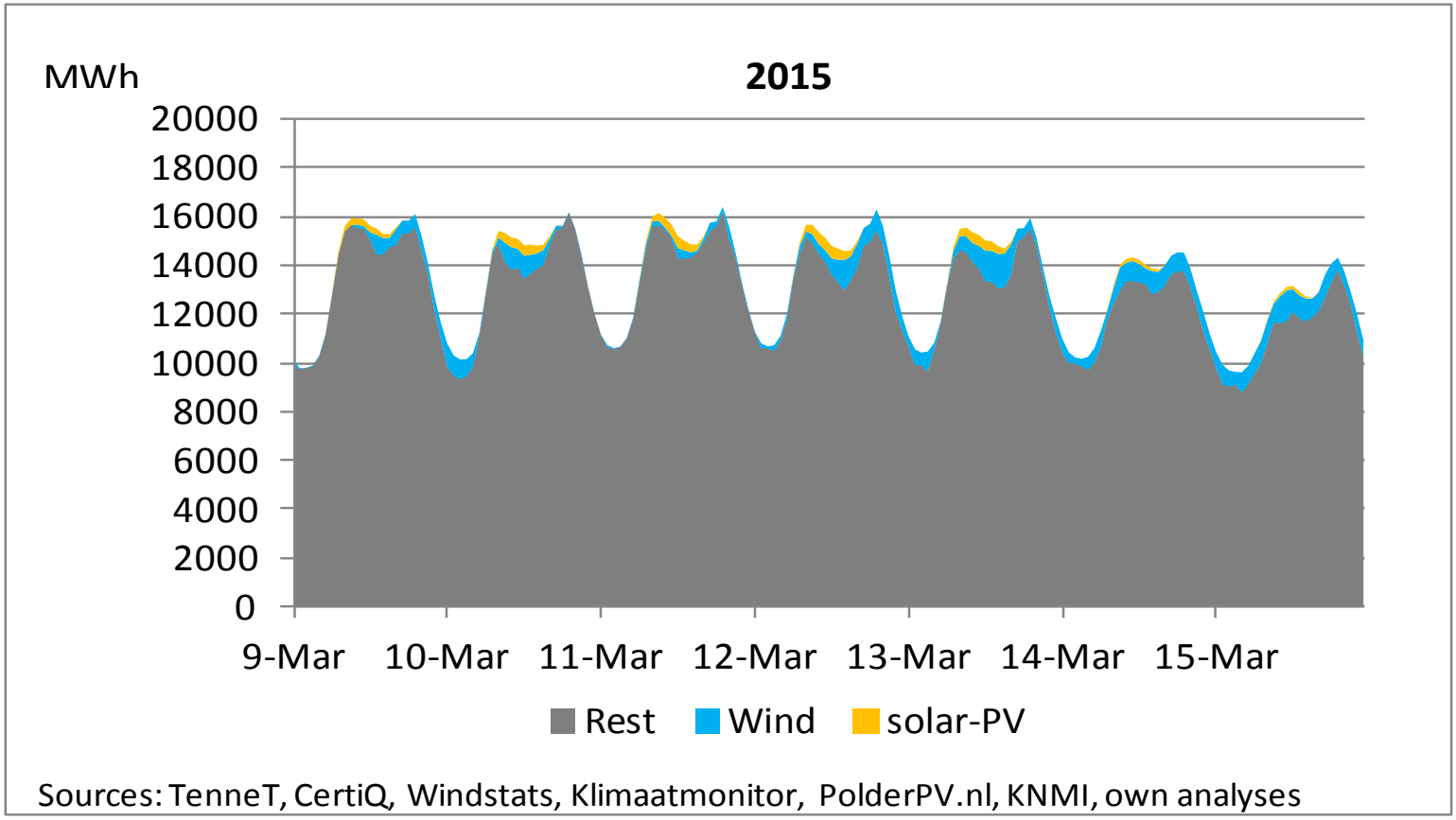

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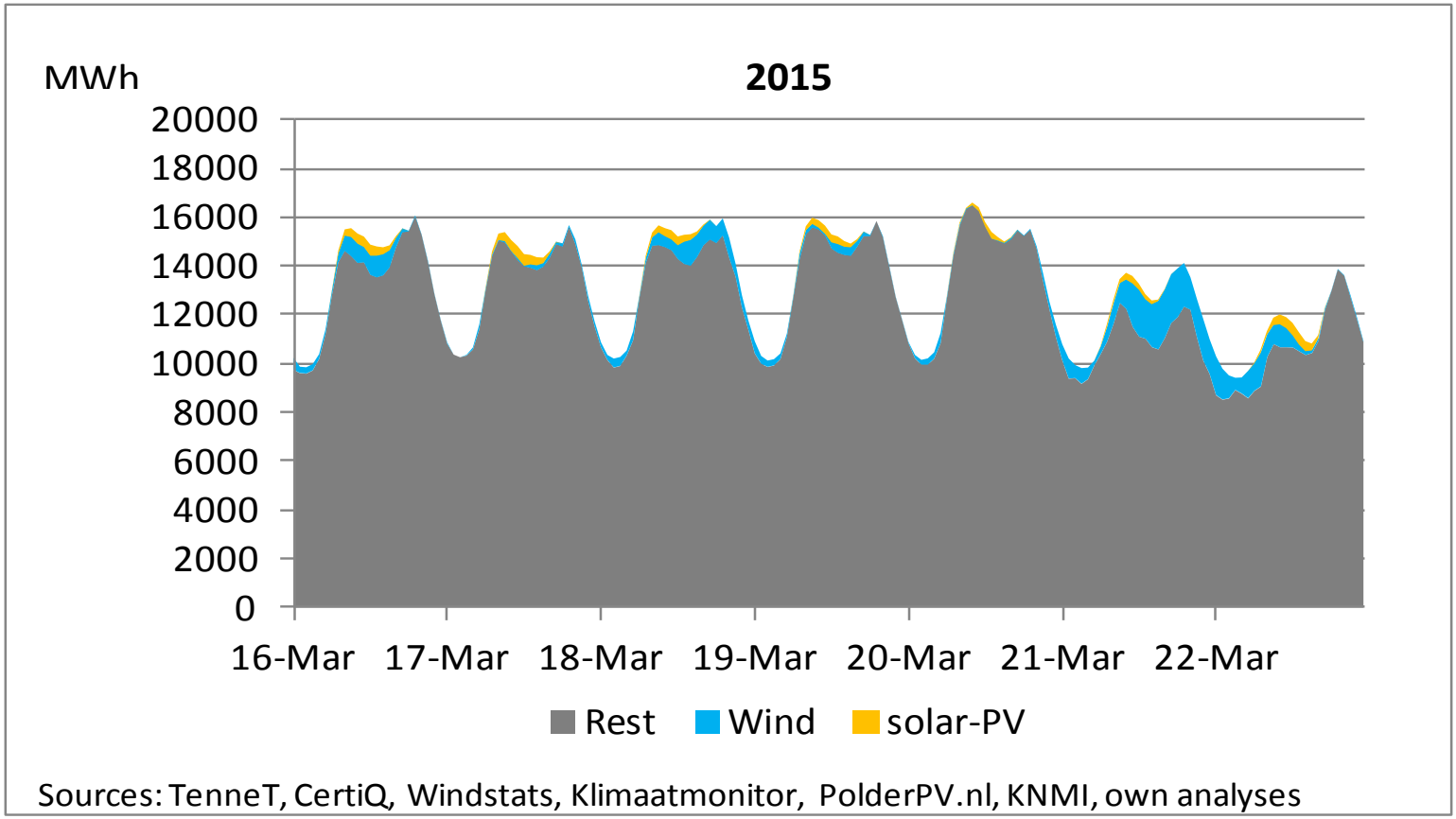

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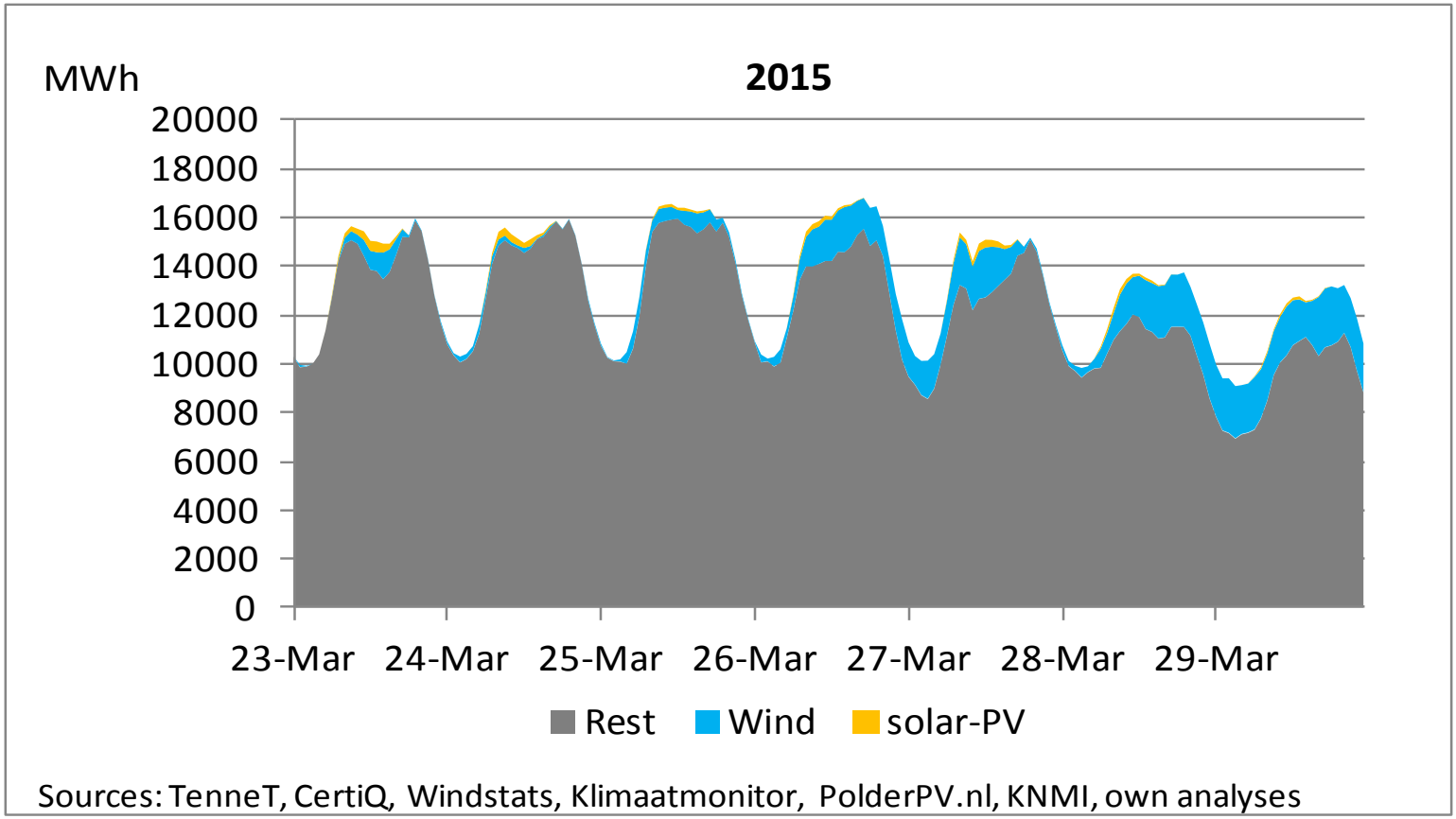

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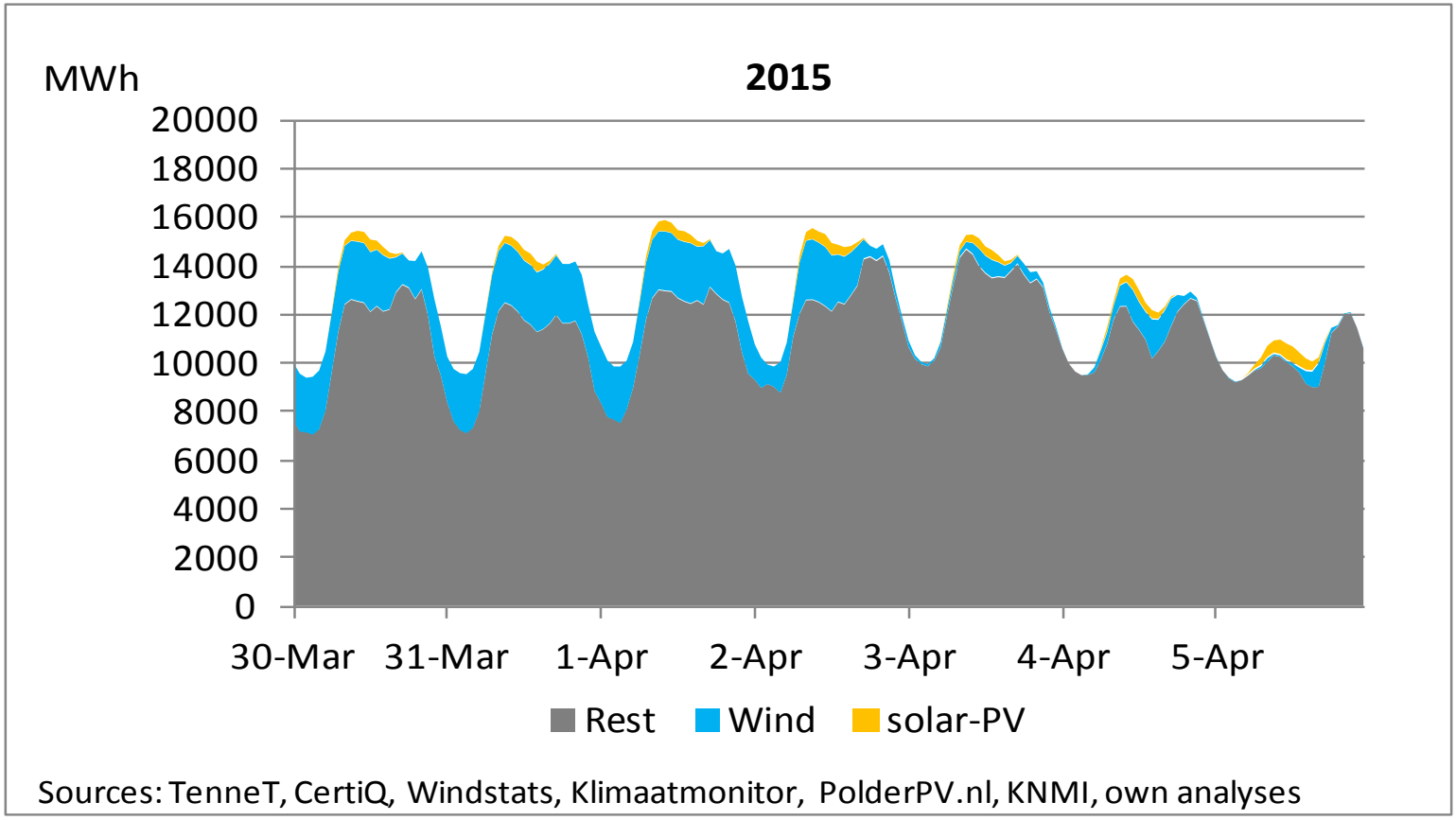

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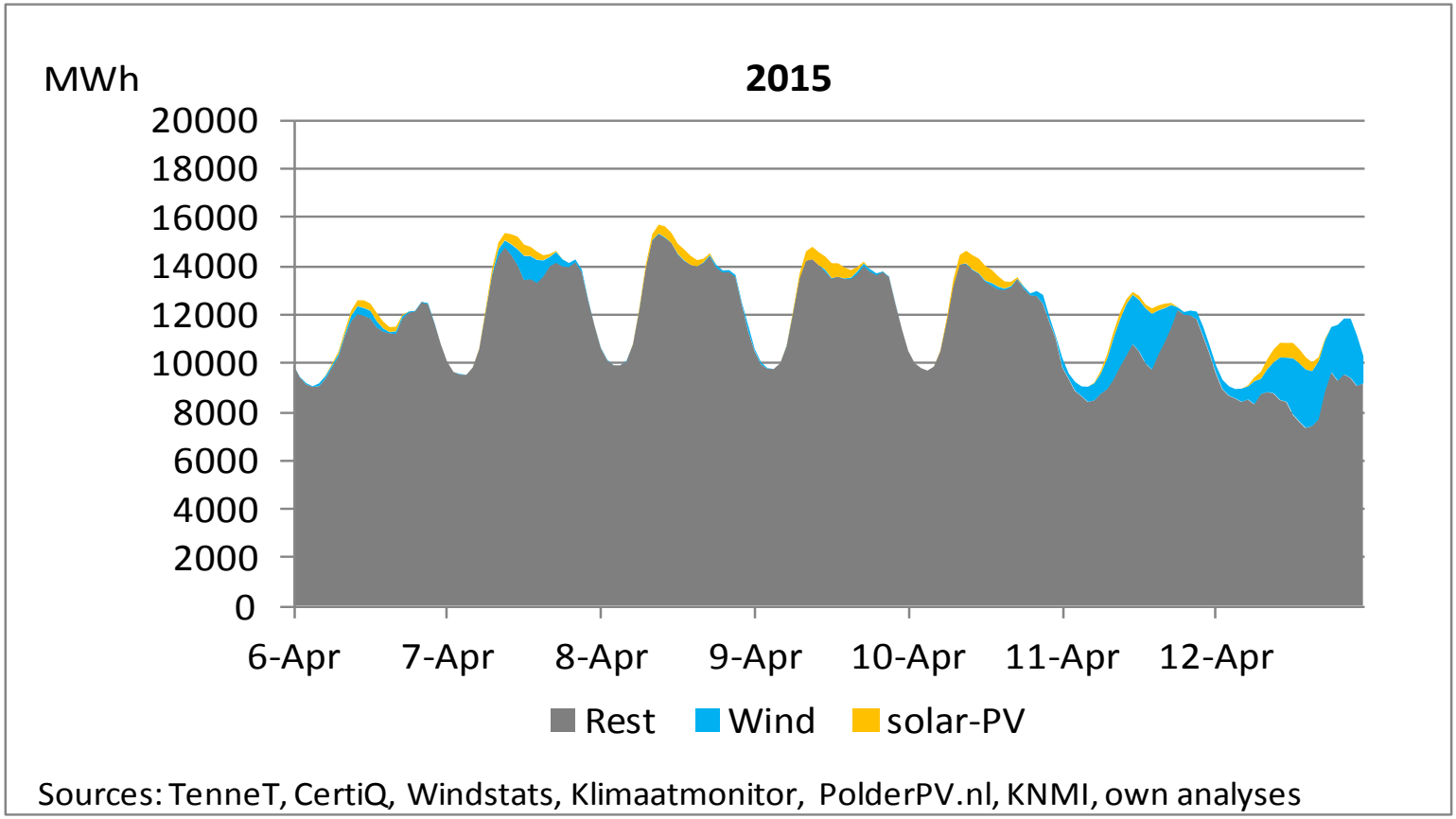

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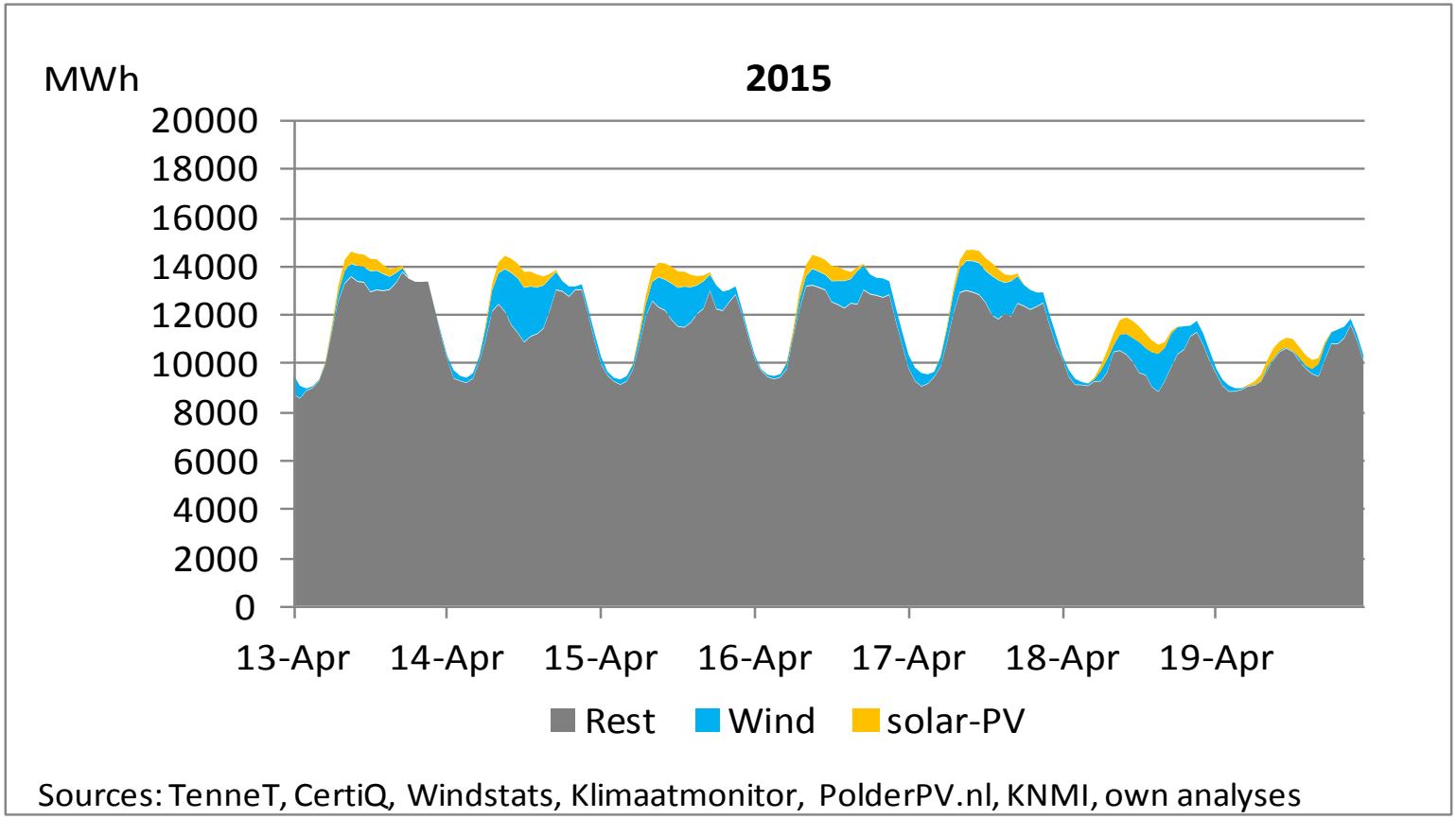

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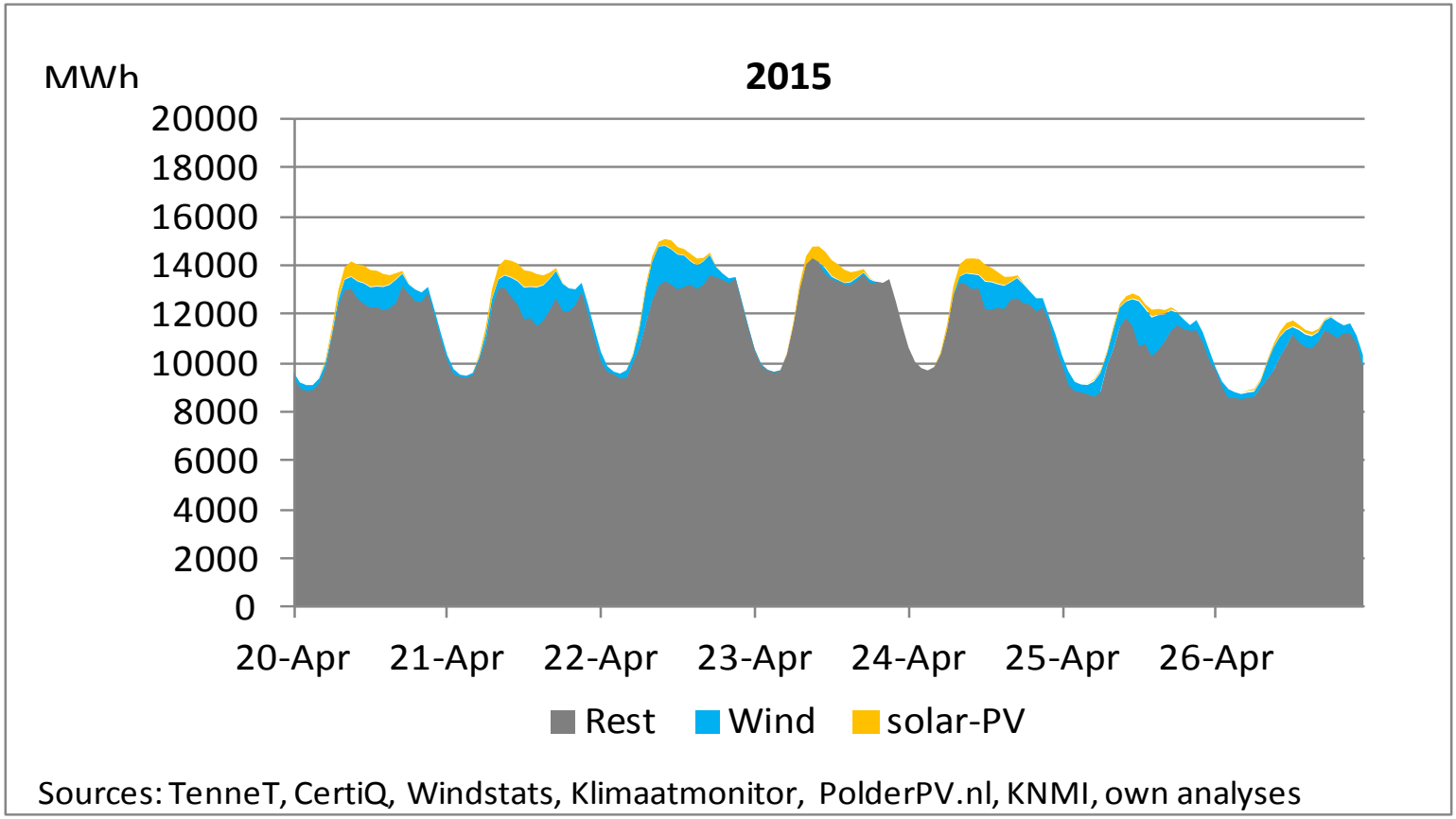

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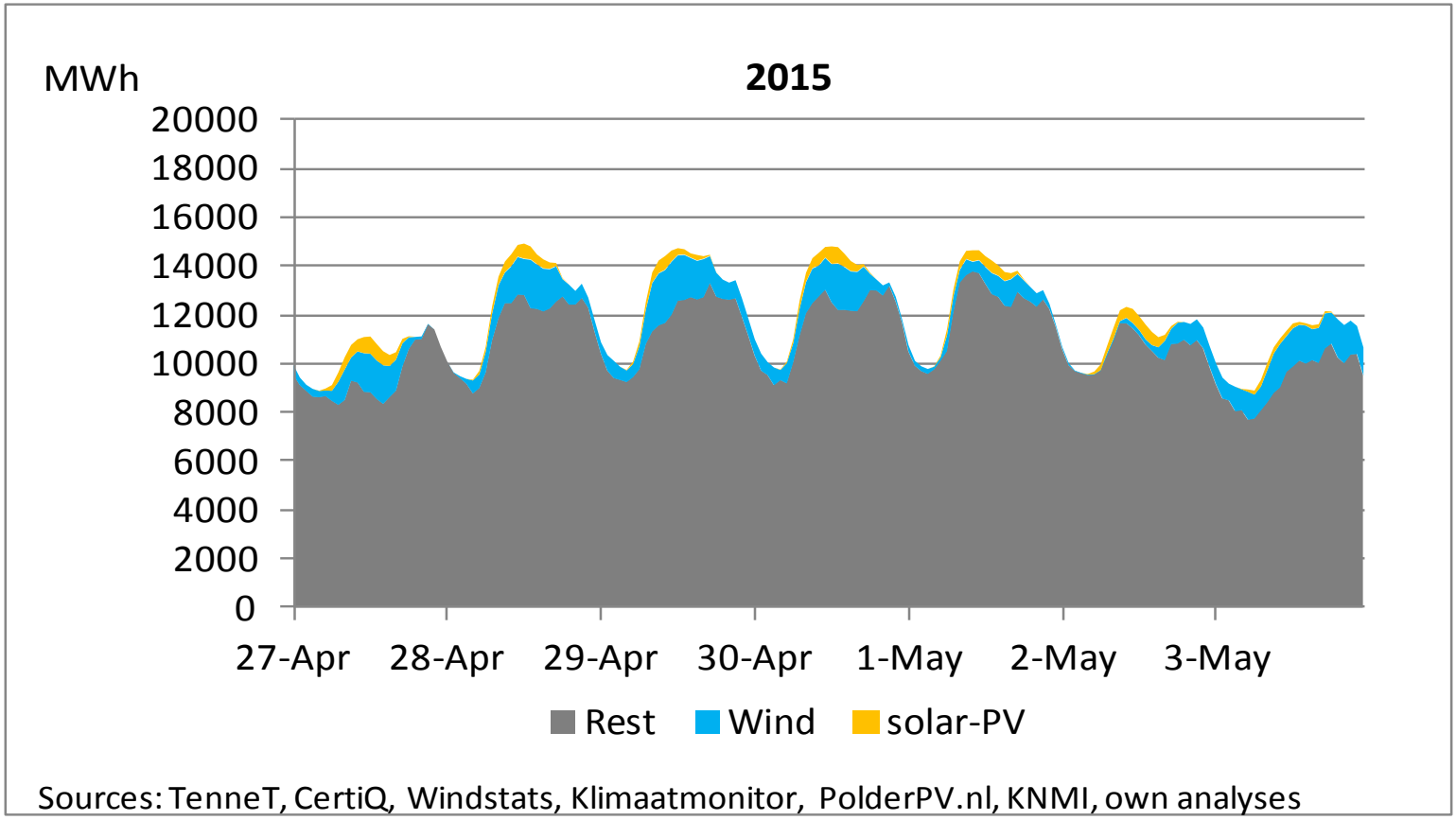

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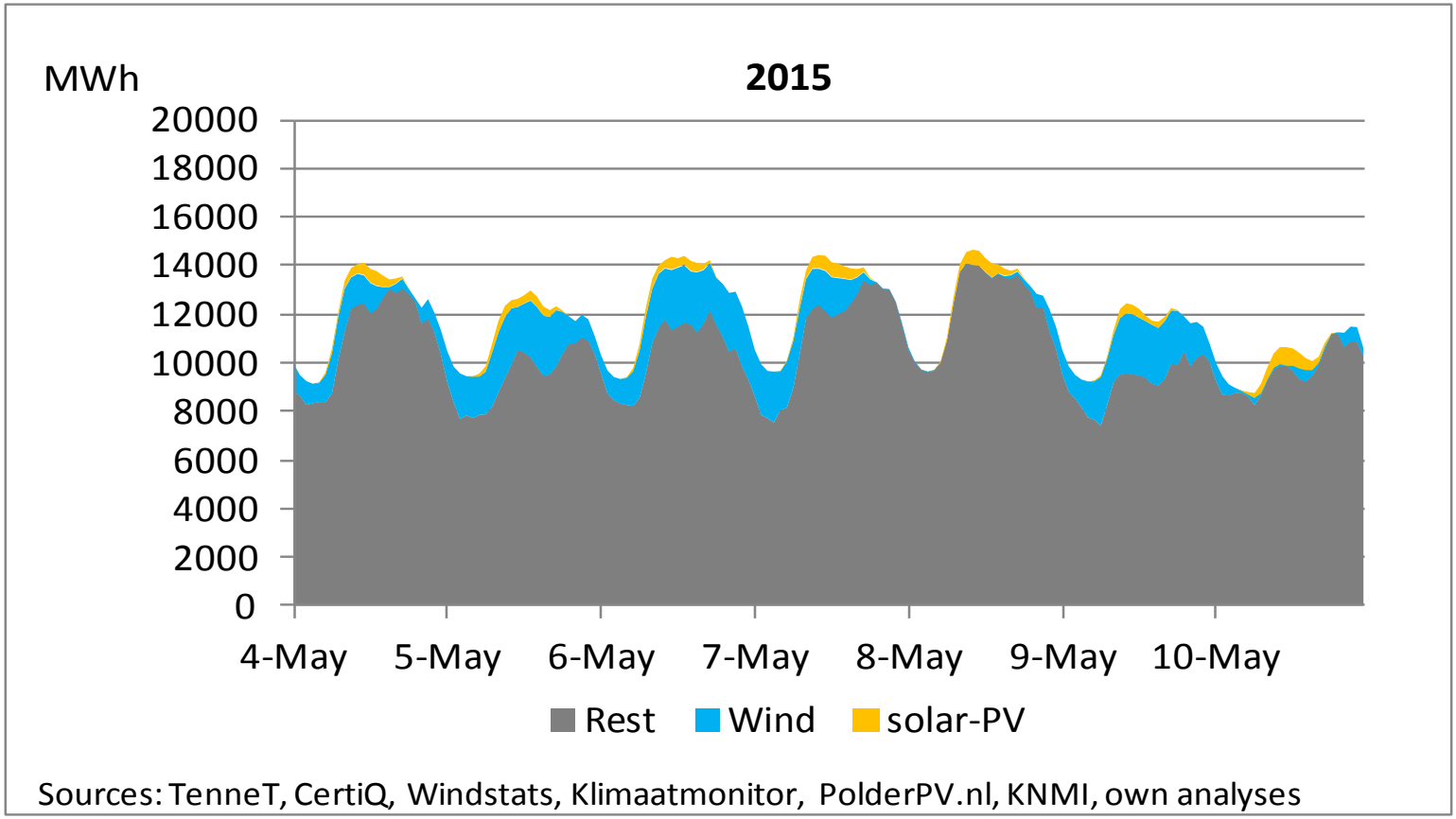

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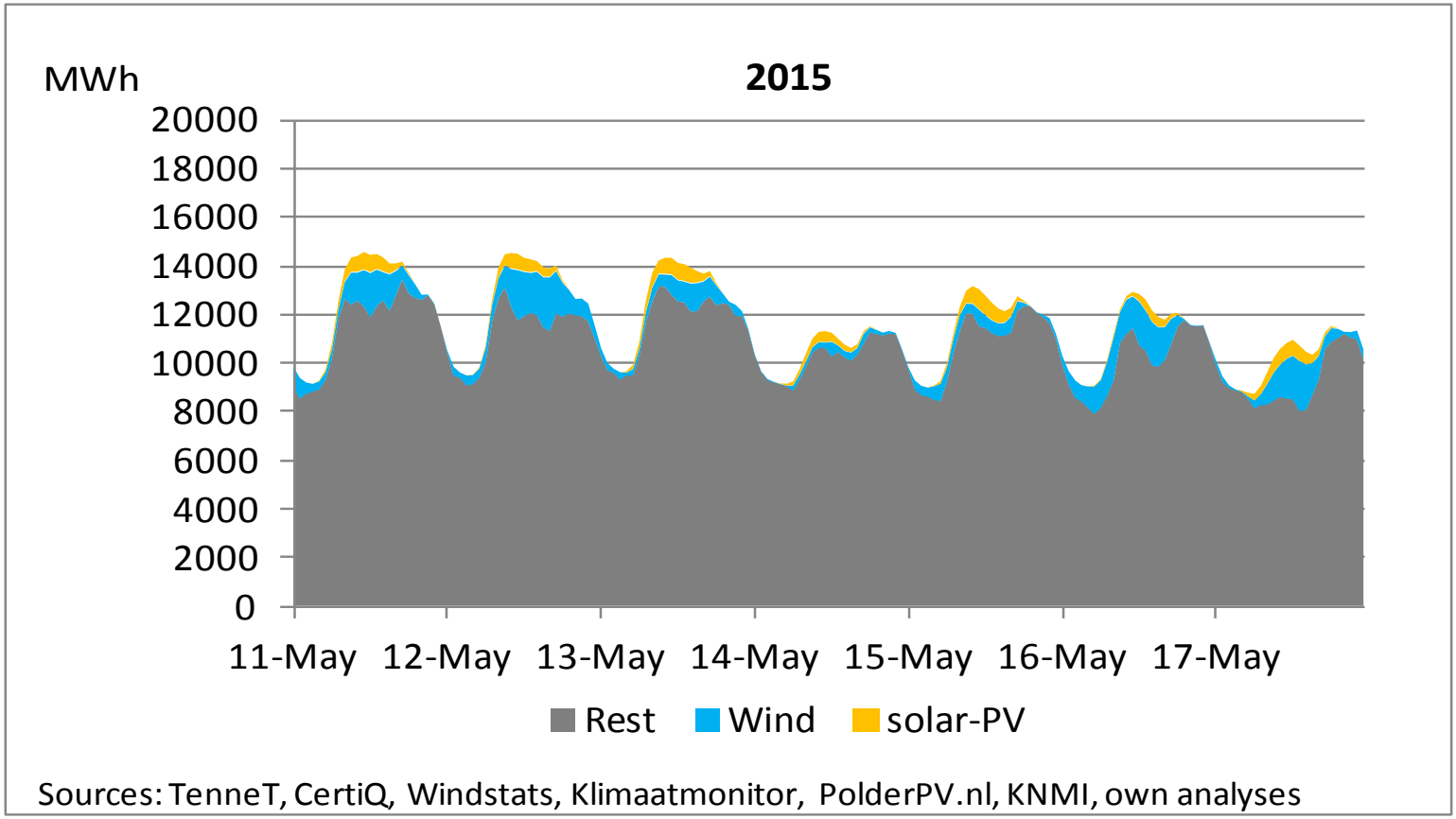

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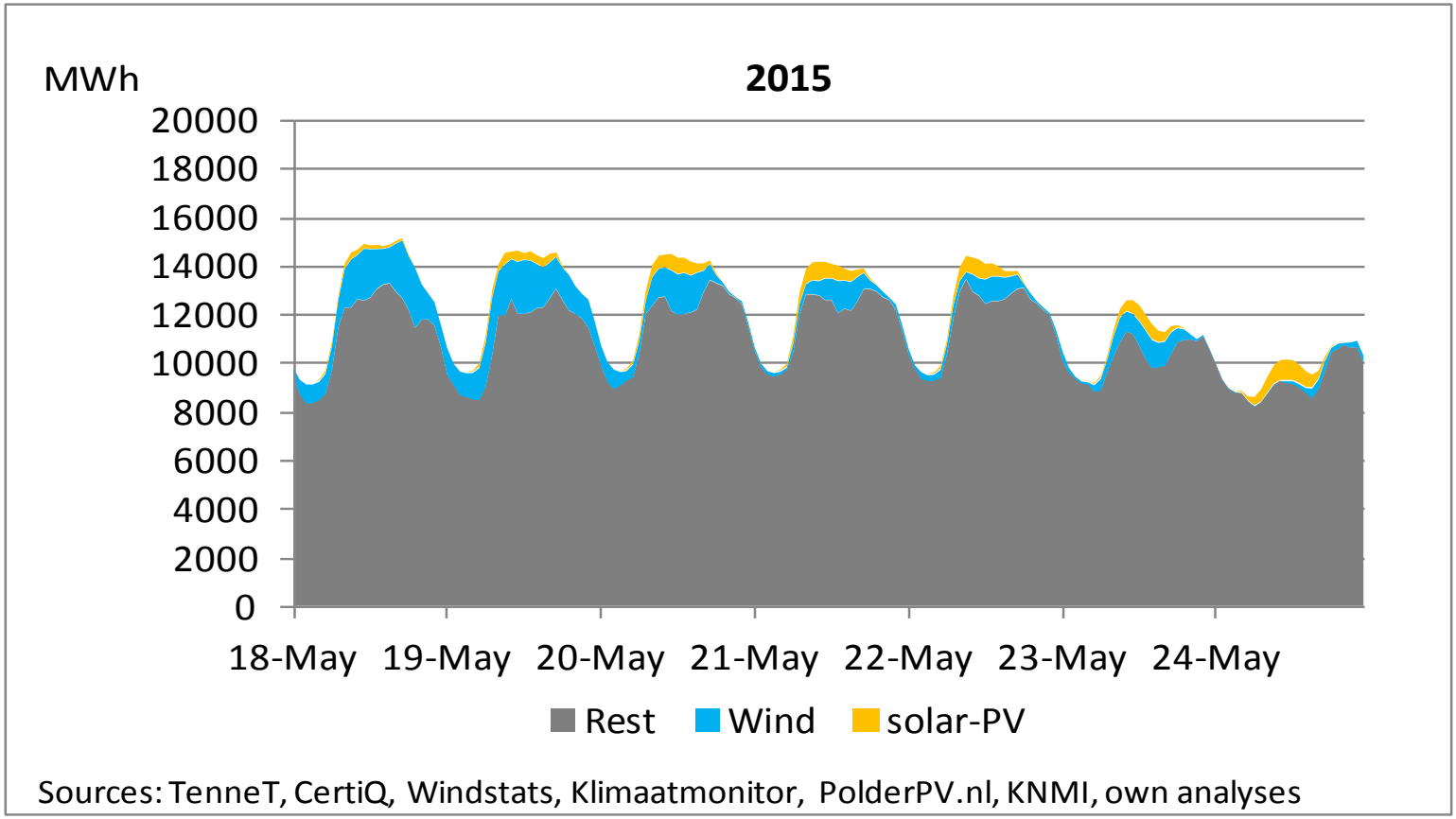

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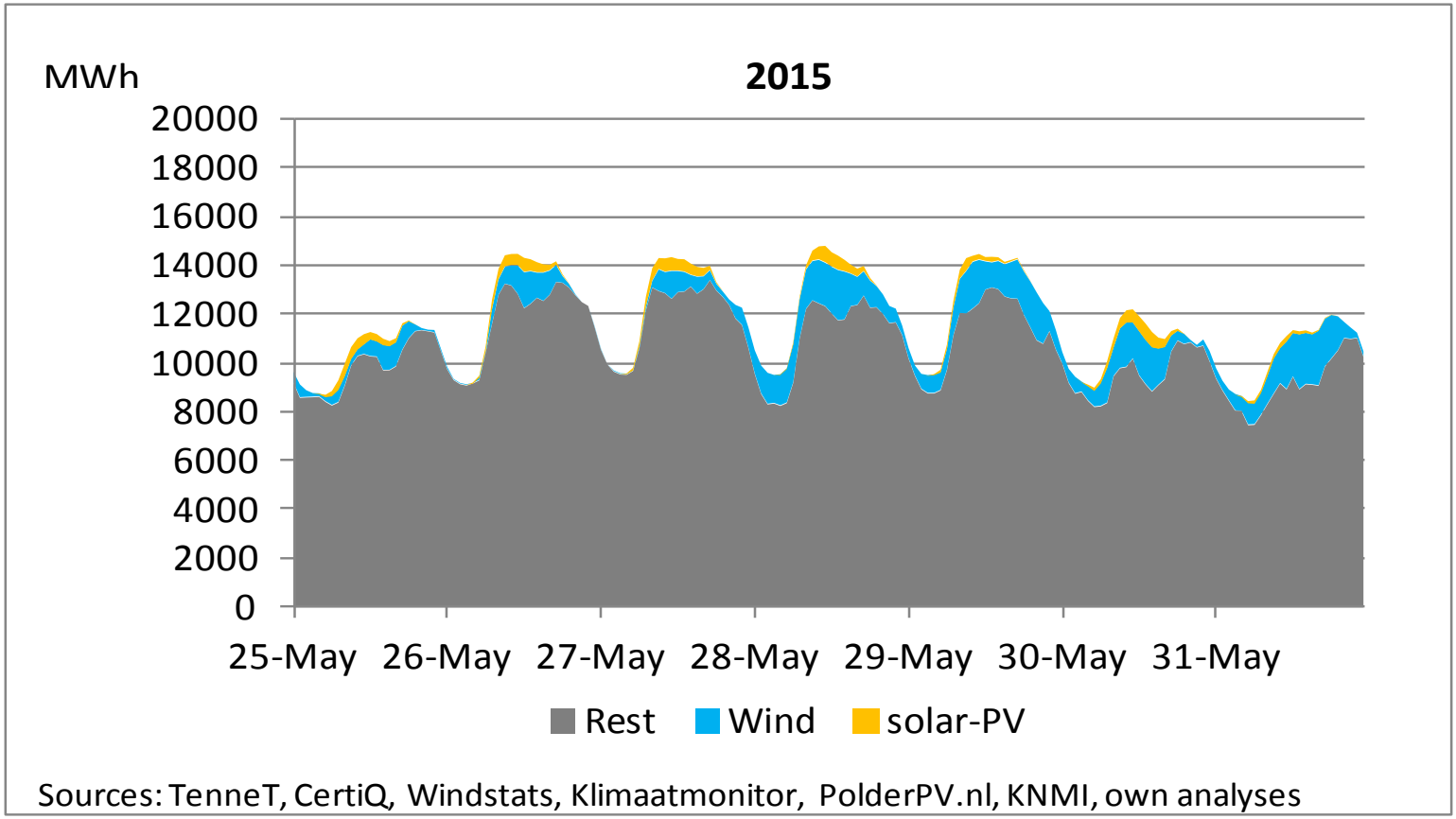

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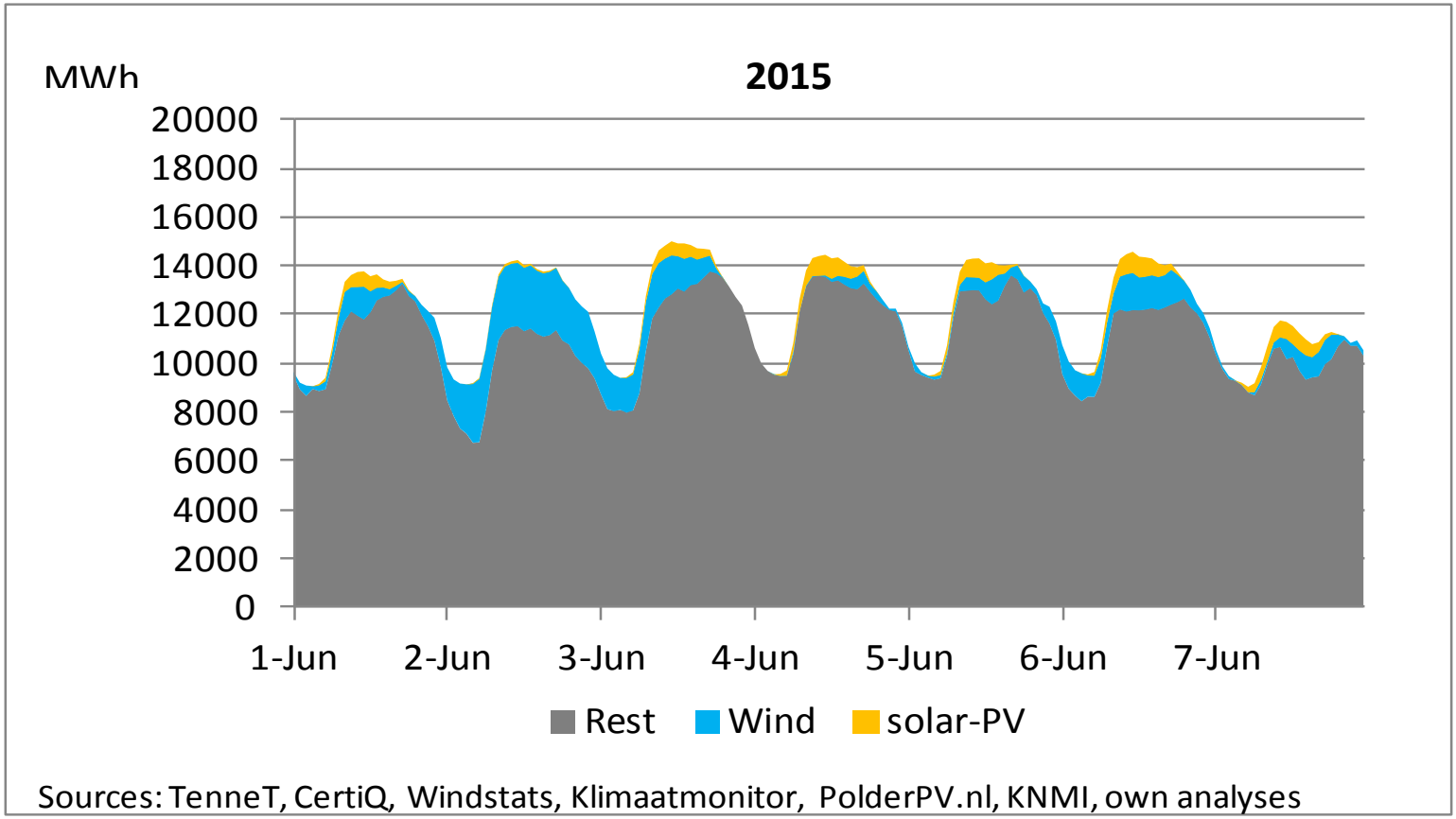

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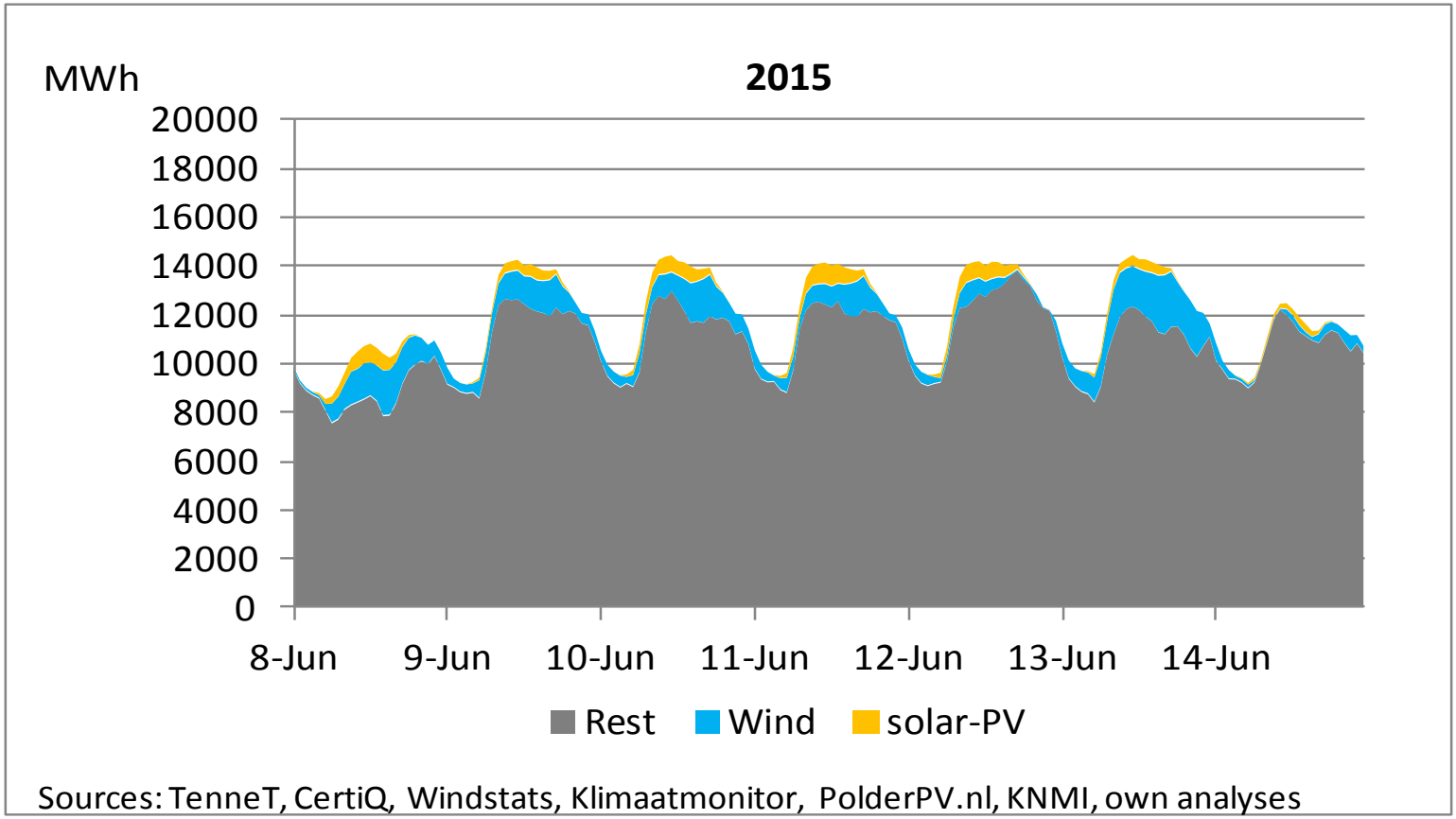

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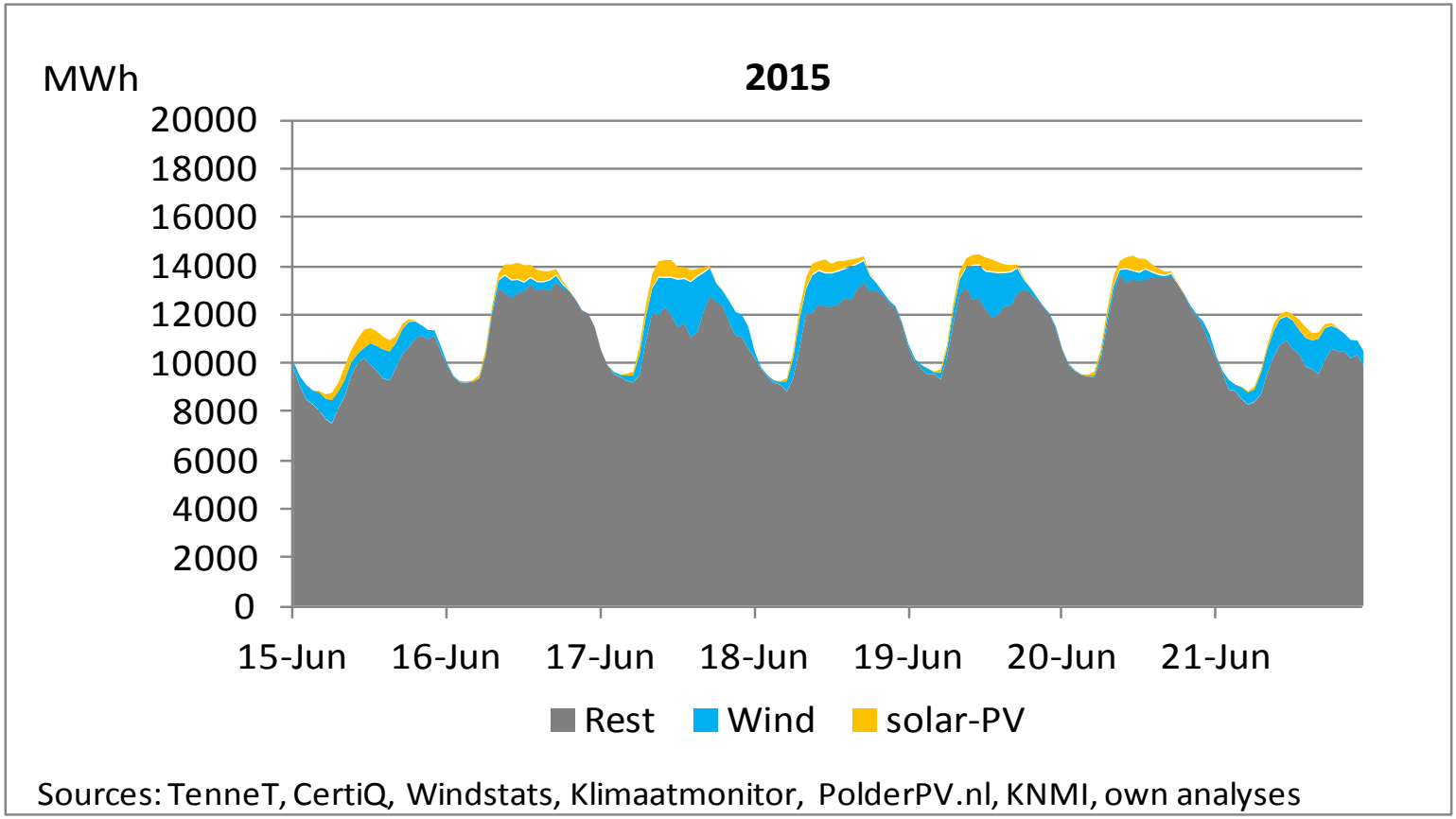

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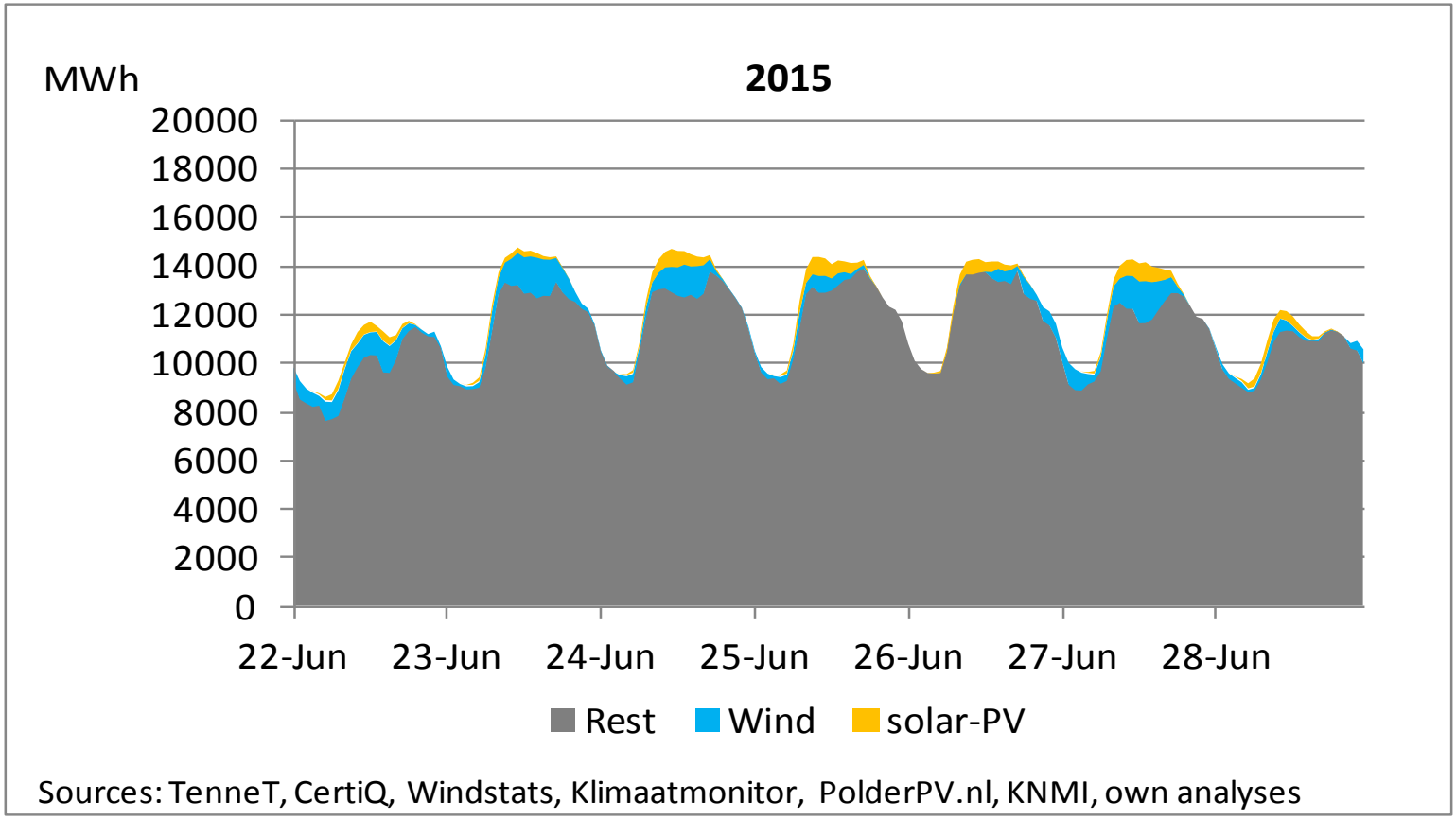

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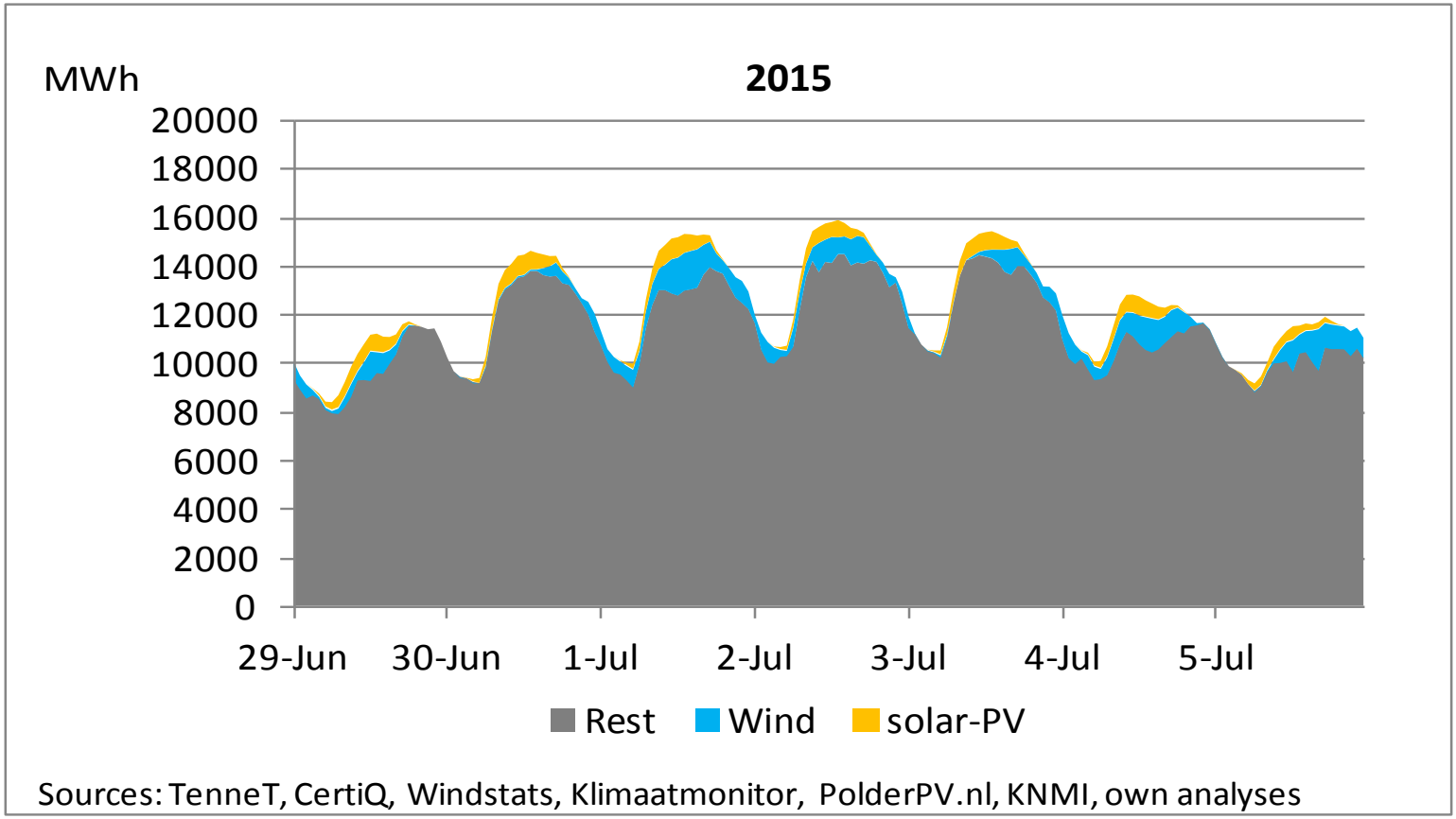

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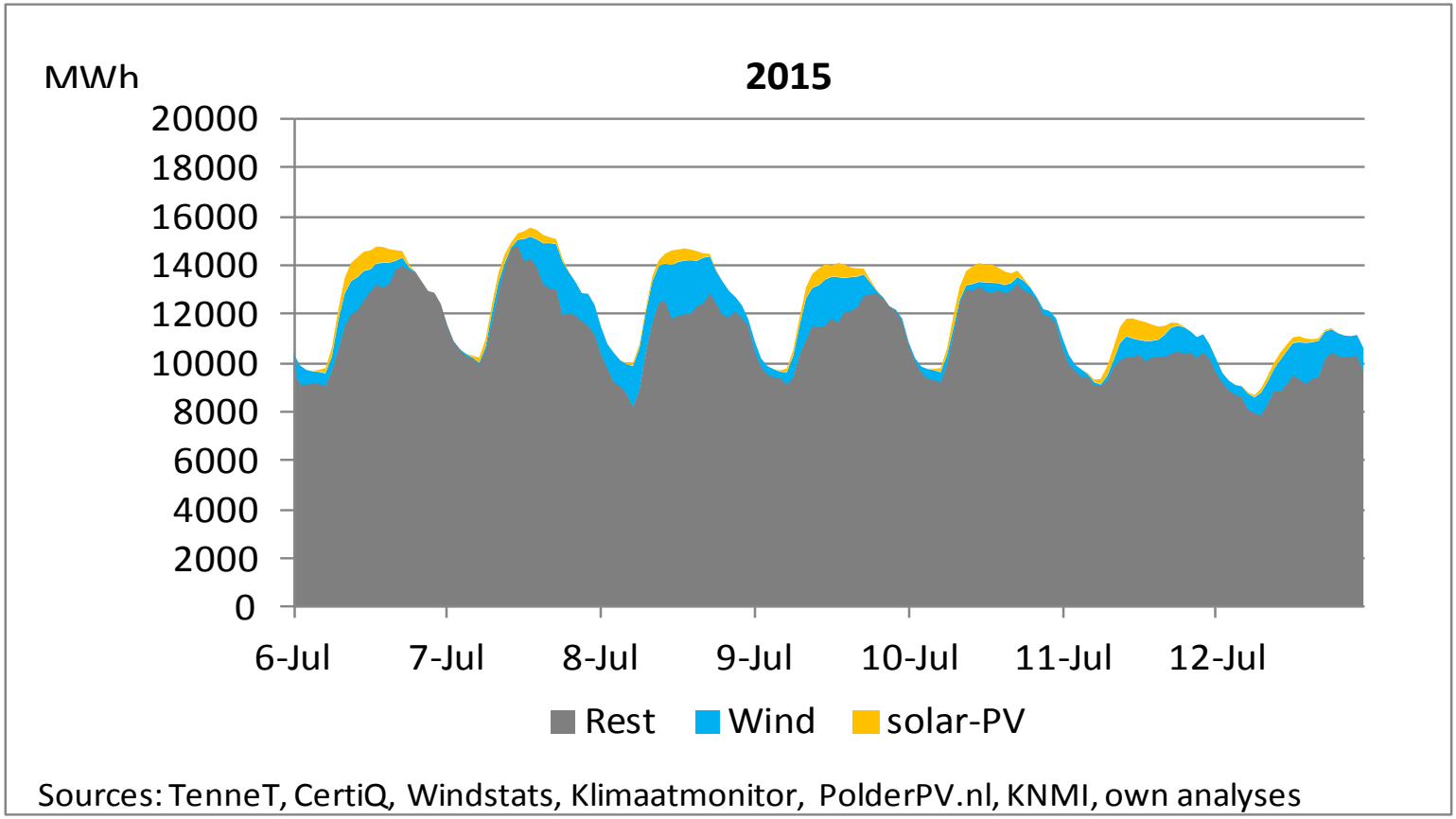

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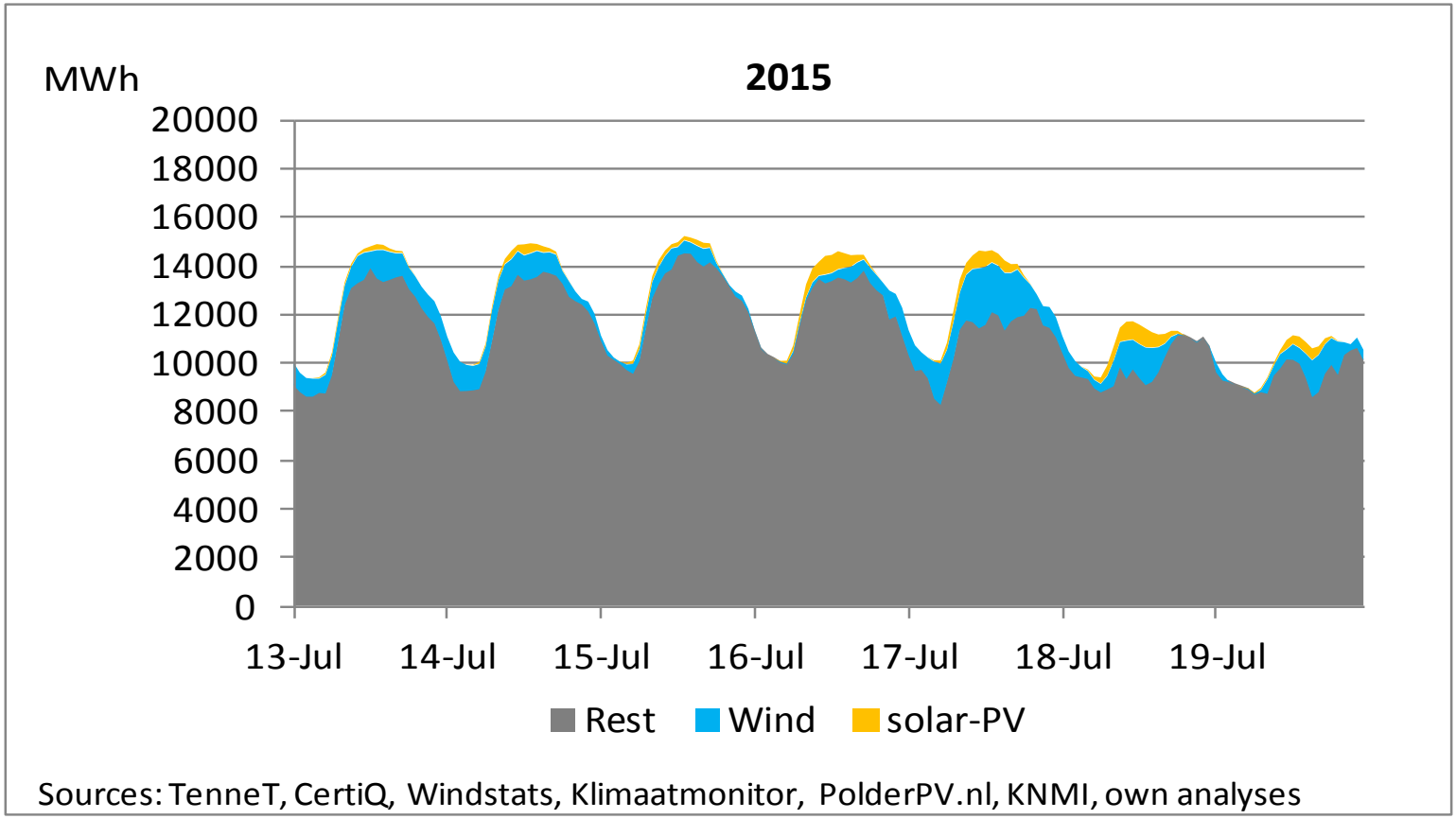

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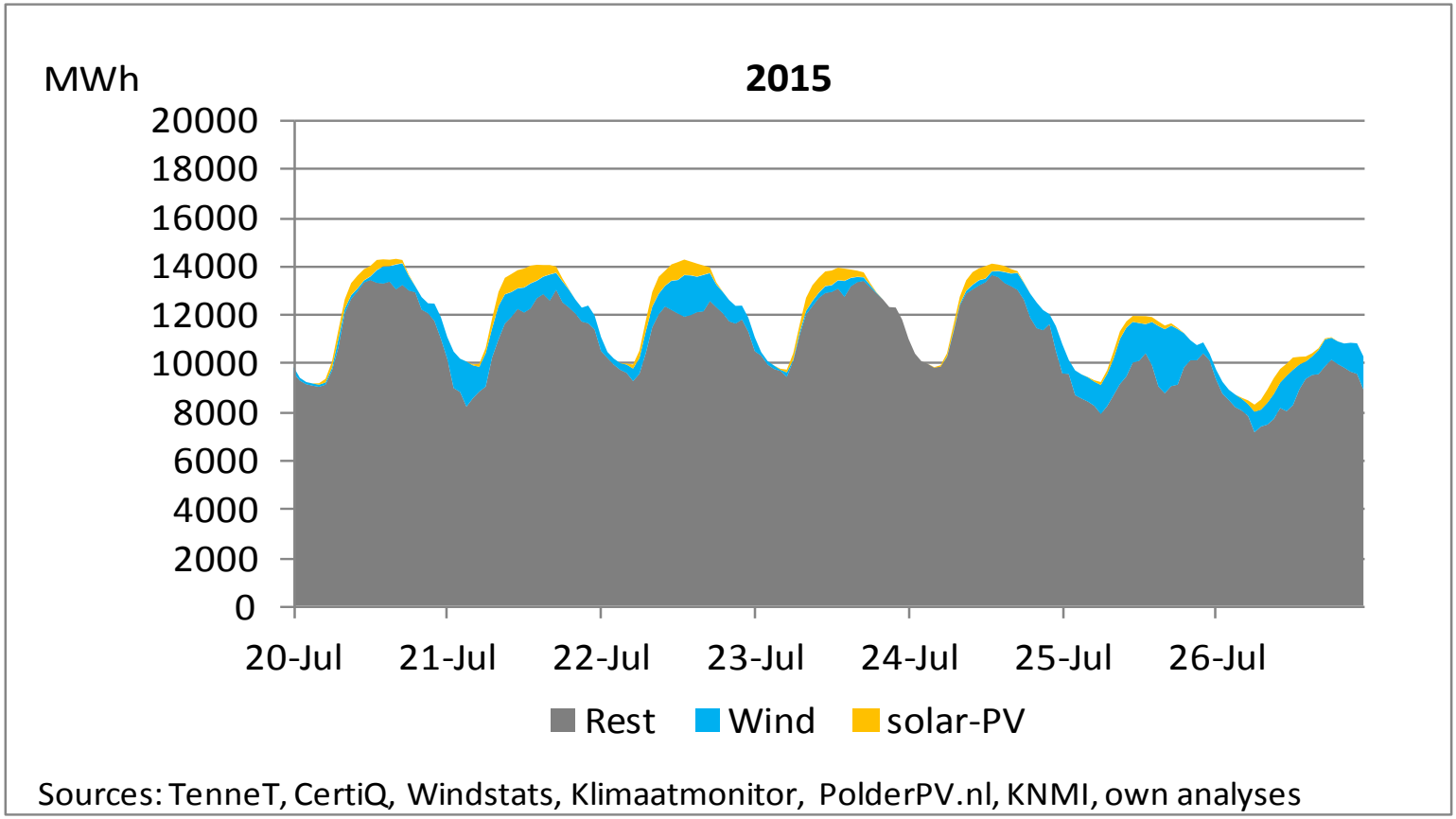

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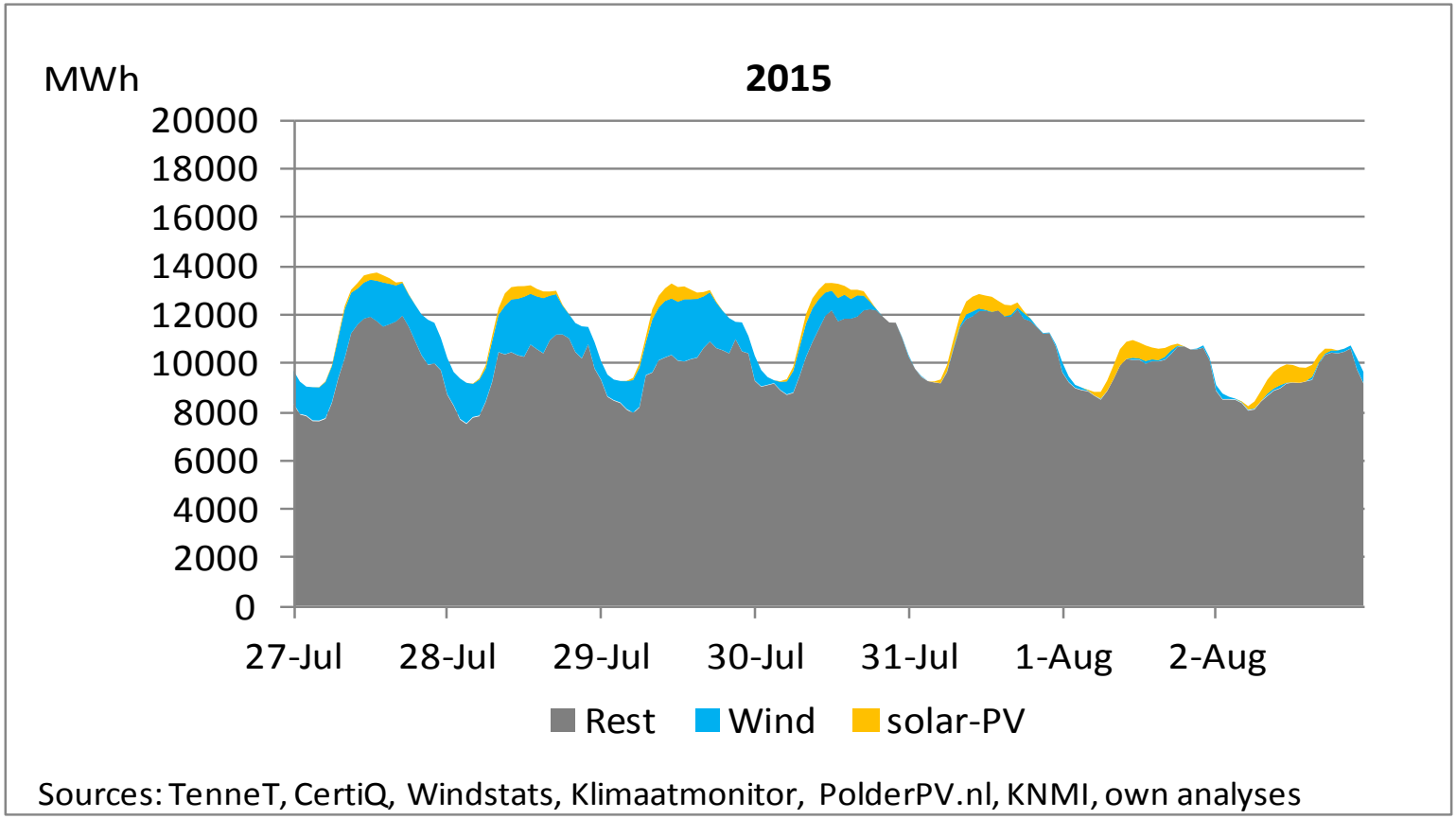
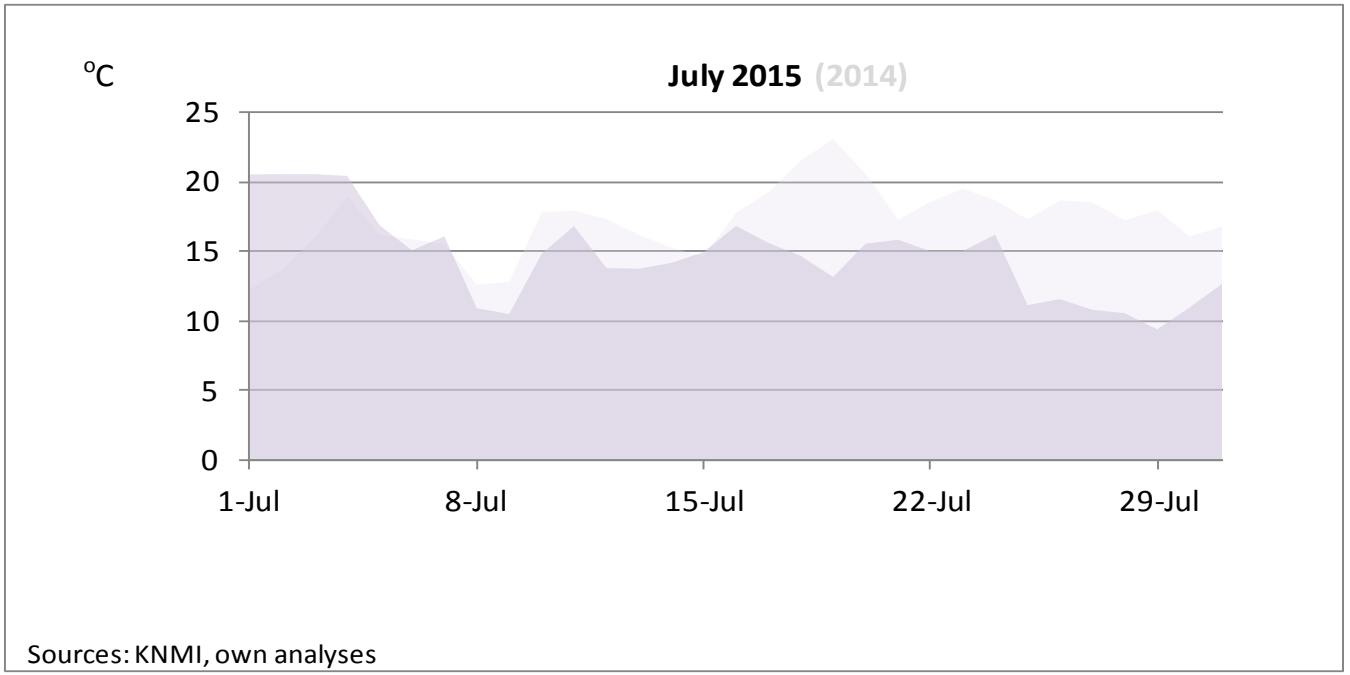


Sources: TenneT, CertiQ, Windstats, Klimaatmonitor, PolderPV.nl, KNMI, own analyses

MISCELLANEOUS

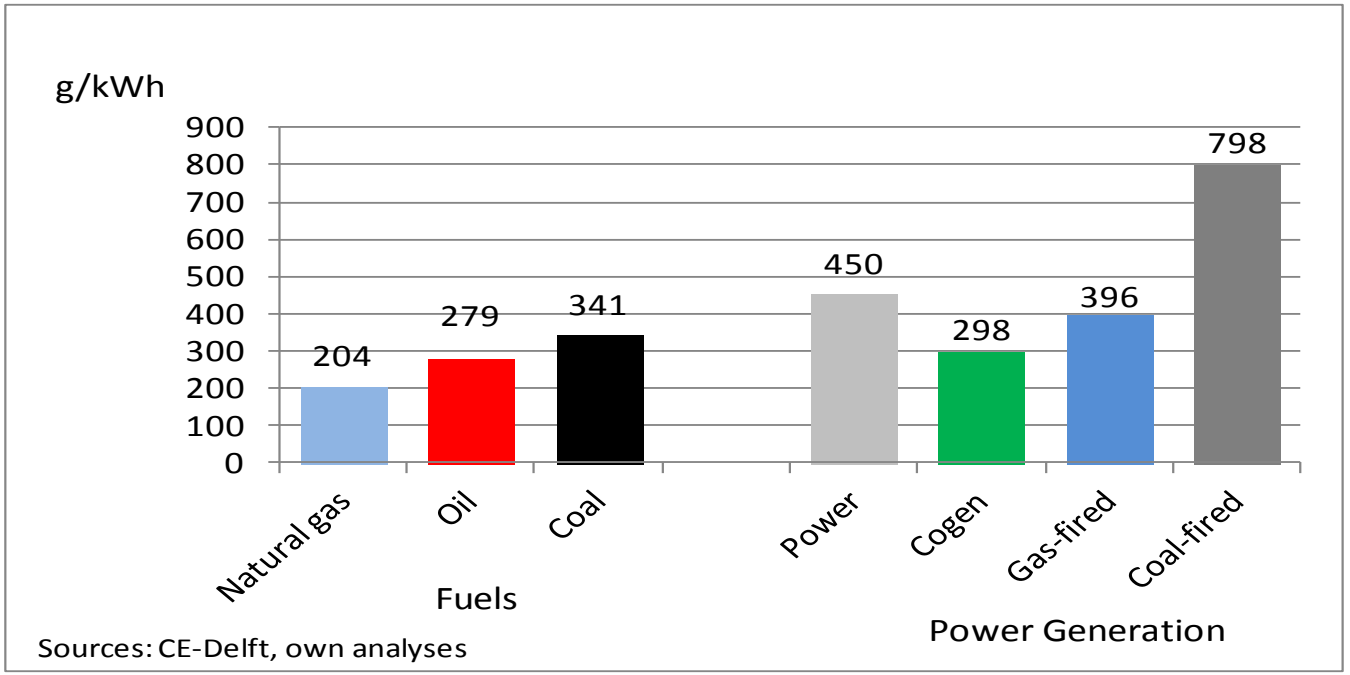
Effective Temperature July 2015



Sources: KNMI, own analyses

The effective temperature (temperature including wind shield factor). For comparison, effective daily temperatures of July 2014 are presented at the background.

Fuel Specific CO2 Emissions



Characteristic CO2 emissions used in this presentation.

Epilogue

b.m.visser@pl.hanze.nl

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This presentation is based on numerous sources which present data on energy demand and supply in The Netherlands. These data, however, do not cover the entire energy system. Some approximations and scaling factors were thus needed. The author would like to thank students from Hanze University of Applied Science in Groningen and various energy experts in The Netherlands which gave suggestions for improvements of the methods used. Currently, the aggregated results of this work are in good agreement with data supplied by the Dutch National Office of Statistics (CBS). It is believed by the author that the detailed results in this presentation give a fair presentation of the complex reality of the Dutch energy system.

Nevertheless, the author invites readers to comment on the data provided with the objective to further improve this work. After all, good and reliable data are at the heart of any successful policy to make our world more sustainable.